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American Politics and Electricity.

THERE is a marked contrast between the state of affairs political in Britain and the United States just now. In this country everything is quiet at St. Stephen's, and unless there are unforeseen developments, will remain quiet until Parliament resumes in November, though there is likely to be a good deal of oratory regarding possible policies to be put before us to influence voting at the General Election next May. In the United States, however, the temperature, and also the temper, of the people has already begun to rise, and interest in the Presidential Election has found its way into the offices of electrical journals. For example, the issue of the *Electrical World* for August 25th deals exhaustively both in its leader pages and elsewhere with the presidential candidates and the electrical industry, the views of Secretary Hoover, Governor Smith, and President Coolidge being reviewed. In this country we have had a prolonged spell of political intervention by all parties in connection with electricity supply and may be excused for profoundly hoping for peace and quietness in that respect for years to come; at any rate, we should have freedom from new Parliamentary electricity supply policies. There are minor matters of detail that may require attention from time to time, but, speaking generally, what the country requires is time for the Commission, the Board, and the electrical undertakings, to "get on with the job." It may happen that the electrical industry, if we can consider it apart from electricity supply, will be closely interested in any safeguarding and Empire Development policy that may be introduced for the electorate to express its views upon, but that is a matter for the future.

The questions which seem to link up the presidential election in the States with the electrical industry are water-power development and the regulation of public utilities. Governor Alfred E. Smith, of New York, in accepting the Democratic nomination, gave his views condemning the past publicity efforts of the utilities, advocated State ownership and control of water-power plants and sites, urged

(says the *Electrical World*) "that a seven-state political board be saddled with the Boulder Canyon," and also made general statements about Muscle Shoals "that indicate that he favours Government ownership and operation." He advocated a semi-governmental agency called a "power authority," and believed in a water-power policy that our contemporary says "leading electrical men believe to be unsound, unworkable, and far inferior to the policy now in successful operation." "Mr. Smith . . . advocates a degree of government participation in business which would develop a political bureaucracy." "His policy and his statements will not command the assent of electrical men."

With regard to Secretary Hoover, he did not advance any policy respecting the utility industry in his acceptance speech. "He advocated private enterprise and no participation by Government in business, but postponed explicit statements on the utility industry to a later speech in which he supported the Boulder Dam project and the highest dam that the engineers will recommend." This Boulder Dam matter is a project which Radical members of the Senate declare is being blocked by the "power trust." Our contemporary says that Mr. Hoover's policies announced in the past are sound, and hopes that in his speeches he will deal with the problems confronting the industry frankly and courageously. It asks him to reiterate his past policies which have been favourable to the development of electric service on a proper business basis.

President Coolidge is reported to hold that most of the problems arising in connection with the public utility interests now under investigation by the Federal Trade Commission may be solved by State instead of Federal legislation. He is closely studying the recommendations that have been made on the matter, but at present views the question as being much more within the province of the States than of the Federal Government, the public utility corporations being chiefly under the control of the States and their business being inter-state only to a very small degree. He is examining the Boulder Dam project and the report of the special engineering board respecting it. The President does not seem yet to have made up his mind as to what recommendations he may submit to Congress regarding the public utility corporations.

The foregoing is our first intimation of the subject in these pages. The matter will not be one of absorbing interest on this side, but it is timely to indicate the situation and its possibilities from the electrical development point of view.

Factory Lighting.

A LETTER by Mr. W. H. Stone which appears in our "Correspondence" columns to-day draws attention to an important aspect of the subject of illumination in workshops, which should be borne in mind by the organisers of the Factory and Workshop Lighting Campaign. It is a singular thing that, as our correspondent points out, many workmen are fond of "a big light right on the job" in spite of the discomfort entailed by the resulting glare, and in spite of the demonstrable fact that they cannot see their work so well, with contracted pupils, as they would with a lower intensity of illumination, free from glare. But it is also true that when the matter is put before them in the right light, so to speak, they are willing to listen to reason and open to conviction; their opposition is largely due to their innate conservatism, which leads them to vote in favour of established customs.

In some cases, no doubt, their objection is well taken. If an over-zealous illuminating engineer, for instance, provides a workshop with a system of lighting so uniform and shadowless that "flatness" results, he defeats his own object—the forms of machines and tools lose boldness of outline, and though the general standard of illumination may be considerably raised, the measure of visibility is diminished A fair proportion of direct lighting, with the resultant contrast of light and shade, which gives definition and perspective, is therefore essential. An admirable system of machine-shop lighting is that which Mr. F. J. Moffett described in the ELECTRICAL REVIEW of December 24th, 1920—general shop lighting supplemented with 10-watt low-voltage lamps mounted in jointed fittings on the machines, with focusing reflectors which completely protect the operators' eyes from glare. Not only does this system provide a more effective light to work by—it is also very much more economical than a practically uniform and shadowless system, which must necessarily be designed for a far higher intensity of illumination.

As Mr. M. Luckiesh has pointed out, "the lighting problem has not been solved when a certain intensity of illumination has been provided at the work-points or work-planes. Proper lighting finally includes proper seeing, and therefore all classes of work should be studied in detail. . . . After a proper quality of light has been selected, it should be distributed so that the objects are properly modelled by light and shade." No system of lighting is universally applicable—each case should be "studied in detail."

To Earth or to Insulate?

WE believe that the spirited article by Mr. T. C. Gilbert on the subject of safety in the home, which is concluded in this issue, will be read with interest by those who differ from his views as well as by those who agree with him; the author writes with conviction born of long experience not only of electrical installation work, but also of men, women, and architects, and his racy comments are pregnant with shrewd practical common-sense. We cordially welcome his vigorous support to the views which we have consistently put forward with regard to the subject of compulsory earthing and three-core flexibles—but he is not content with destructive criticism, he develops the proposition that safety in the home is to be attained most surely by going to the opposite extreme—by eliminating earthed metal, *and all other metal*, as far as possible.

As Mr. Gilbert himself points out, that is largely a reversion to the practice of earlier days—but it is none the worse for that; we have adopted the methods of our predecessors in many cases, with advantage, and with the aid of improved materials and technique they have proved to be sound and good.

Once more we would press for discrimination in dealing with this question: a house is not a factory, and living rooms cannot be treated like workshops; on the other hand, kitchens and sculleries are workshops, and, like bathrooms, call for special precautions. To those advocated by Mr. Gilbert we would add that of education; the public has been taught to refrain from seeking for a gas leak with a lighted match, and looks upon the occasional transgressor as a benighted idiot—in the same way let it be made acquainted with such risks as must inevitably exist in electrical installations and informed how to avoid them. Whilst we agree almost wholly with Mr. Gilbert, we regretfully hold, despite his arguments, that "the ideal of 100 per cent. safety" is unattainable. Let us aim to approach it as nearly as possible, on practical lines, and enlist the co-operation of the user to make good the deficiency.

Another Libel on Electricity.

THE *Daily Chronicle*, reporting an inquest on a victim of blood poisoning, heads the item "An Electric Iron Causes Death," and says: "A danger connected with the use of electric irons was revealed" at the inquest. It was shown that the deceased woman had received a burn—"just a graze on the wrist"—while using an electric iron; septicæmia set in, and she died in hospital. The same result might have ensued from a burn with a common flat-iron, or a gas iron, or from a scratch with a pin or her own finger-nail—but the word "electric" offers a chance for a sensational headline which must not be missed.

Electric Heat in the Dairy.

An explanation of the necessity for perfect cleanliness and of the methods by which it is achieved; a valuable opening for electricity supply.

By H. AMBROSE CARNEY.

AT the present time British farming is passing through a period of readjustment. Due to a number of causes, arable land is decreasing in acreage, and pasture land, from decay or as the result of proper laying down to grass, is taking its place. Consequently, the head of stock is greater to-day in England than it has ever been, and the production of milk is steadily increasing. These changes have a special interest for electrical engineers engaged in the development of the farming load.

Until quite recently the production of milk in this country was carried on under rather lax regulations,

Fig. 1.—The "Davies" Milk Pail.

but armed with the powers conferred by the Milk and Dairies (Consolidation) Act of 1915, the Ministry of Health issued a Milk and Dairies Order, which commenced to operate in 1926, and is now fully in force, except for two clauses.

The articles of the Order which are of interest to electricity supply authorities are the following:—

Article 12 requires efficient lighting in milking sheds and dairies during the hours of darkness.

Article 13 necessitates an adequate water supply.

Article 21 (1) insists that "every vessel, lid and appliance (which has been brought into contact with milk) shall be thoroughly washed as soon as may be after use, and shall be cleansed and scalded with boiling water or steam before it is used again."

Article 23 requires the cows to be cleaned before milking, and that "the hands of the milker shall be thoroughly washed and dried before milking."

Article 24 stipulates for efficient cooling of the milk.

It will be seen at once that in order to comply with these regulations, there must be ultimately an increased use of artificial light, heat, and motive power if the maximum economy in operation is to be secured. Under the pressure of official inspection the farmer will seek the easiest and least troublesome method of meeting the demand upon him, and with electricity available in his district it should not be difficult to convince him that he needs its aid.

The problems of lighting, ventilation, cold-water supply, and pumping present few difficulties, and so need not be considered further in this article.

There is one requirement, however, which deserves serious attention not only because its provision is insisted on in Article 21 above (and by inference also in Article 23), but because it affords an exceptional opportunity of selling electricity under ideal conditions. This requirement is the hot-water supply. In view of the success of electric water heating in many urban areas, there should be no difficulty in providing the farmer with efficient trouble-free equipment from the start.

Before discussing further the question of electric hot-water supply for farms, it may be of interest to consider briefly why the hot water is required. As the milk leaves the cow it is received in milking pails. Sometimes ordinary buckets are used, but the correct equipment is of the kind illustrated in fig. 1. (As far as possible there should be no seams or joints in which stale milk can remain.) From the milking pail the milk is poured into a weighing bucket suspended from an indicating spring balance so that the weight of milk given by each cow may be recorded. (The modern dairy farmer has already realised that he is paid by the results his cows achieve; the milk records provide him with many valuable data regarding the individual members of his herd, and his method of feeding is such that richer food is provided for the heavier milkers.) After weighing, the milk is passed into a receiving vat, from which it flows over a "cooler" (built on the same principle as a surface condenser), cold water or a refrigerant being used to chill the milk and bring it to a reasonably low temperature. (When the milk is drawn from the cow it is naturally at about blood heat.) From the cooler the milk goes direct into churns, or in the case of farms selling certified milk, it passes into bottles, either directly or through a bottling vat. The various vessels are shown in fig. 2.

It will be appreciated that during each milking a number of vessels are in contact with the milk. Now it is well known that all animal products are liable to go bad if handled under unclean conditions. This is especially true of milk, and it has been estimated by Dr. Stenhouse Williams, of the National Institute for Research in Dairying, that from one to two per cent. of the milk produced in Britain is lost annually through going sour before it reaches the distributors. Taking the 1924 returns, 1,170,000,000 gallons of milk were sent off the farms of England and Wales alone. At an

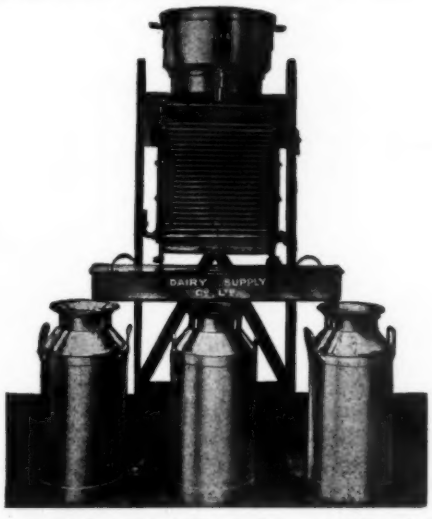


Fig. 2.—Receiving Vat, Milk Cooler, and "Hygeia" Milk Equaliser Supplying Three 10-gallon Churns.

average price of one shilling per gallon, the annual loss would therefore be between £600,000 and £1,200,000. Practically the whole of this loss can be avoided by the use of proper equipment and reasonable care; milk sourness is the child of dirty conditions. The production of milk is really a high-grade chemical process, and it is carried out under such naturally bad

conditions as could exist in no chemical works. Milk, as the healthy cow parts with it, is usually almost devoid of bacteria, and those it contains are of the harmless kind. It is the subsequent handling that determines whether the milk remains clean or becomes dirty and eventually sour. The milk producer's aim therefore is to exclude all contamination by harmful bacteria which find a happy home in the milk, in which they breed rapidly and with disastrous effects. These bacteria can only be kept at bay by ensuring that every surface touched by the fresh milk is chemically clean and bacterially sterile. It is the object of the Milk and Dairies Order to insist on such conditions in the farmers' interest and for the good of the nation's health.

Hot water and steam are the essentials without which these ideal conditions are impossible on the farm or in the town milk shop.

In order that supply engineers may appreciate the value of the hot-water supply from the dairyman's position, some results published by the Institute of Research in Dairying are worth quoting as indicating the effect of cleanliness in milk vessels.

In Table I will be found some figures relating to tests taken with 17-gallon churns (of the type to be seen at any railway station). The tests were taken by rinsing the churns with one litre of sterile water, a portion of the rinsings being then used to estimate the bacteria present. It should be noted that in all cases the churns appeared on inspection to be fit for use.

Table I.—*Bacteriological Condition of Empty Milk Churns which were supposed to be fit for use.*

Condition of churn on inspection.	Number of Bacteria per c.c. of rinsings.
A. Apparently clean and dry	6,200,000
B. Apparently clean but wet	4,100,000
C. Milky water present	18,400,000
D. Milk present	30,000,000

The value of the careful treatment of milk vessels is again shown in Table II, which applies to other utensils used in farm dairies.

Table II.—*Bacteriological Condition of Dairy Utensils.*

Utensil.	Bacteria per c.c. of rinsings.*	Remarks.
Cooler	80,000	Appeared clean after washing in hot and cold water.
Cooler	11,000	Appeared clean, hot and cold washed and steam sprayed.
Cooler	1,464,000	Greasy, washed in hot and cold water.
Receiver	3,870,000	Washed in cold water.
Receiver	53,000	Washed in cold and hot water.
Milking pail	3,000,000	Washed in cold water.

Evidence of the value of heat is provided in the particulars given in Table III.

Table III.—*Keeping Quality of Milk in Churns Cleaned in Different Ways.*

Number of days sweet at 60° F.			
Control.†	Washed.	Scalded.	Steamed
4 days	1½ days	2 days	4 days
3½ ,,	1½ ,,	2 ,,	3½ ,,
3½ ,,	1½ ,,	2 ,,	3½ ,,

These figures indicate that churns merely washed soon produce sour milk, and that scalding and even steaming are essential.

Hot water and steam for dairy purposes are usually produced by a coke-fired boiler, which requires to be lighted twice daily (unless banking losses are incurred). Moreover, the waste heat given off is a distinct disadvantage in the hot weather, when it is very difficult to keep the dairy sufficiently cool, while the dirt, dust and smoke resulting from the proximity of a fire are serious handicaps in the production of clean milk. Moreover, the thermal efficiency of the farm boiler is very low, as will be appreciated from the data in Table IV, based on actual tests and quoted by Bowden in his book on "Dairy Engineering."

* Each utensil was washed with 500 c.c. of sterile water and a portion of the rinsings was used for the count.

† The control milk remained in the sterile vessel into which it was milked.

Table IV.—*Heat Distribution in Average Creamery making* 500,000 *lb. of Butter per annum from Pasteurised Cream. Live Steam used for all purposes.*

Losses.	
Loss in raising steam	30%
Loss in handling coal, ash and incomplete combustion	5%
Loss in chimney draught	19%
Loss in radiation, soot, moisture in fuel, &c.	10.7%
Loss in excess air, leaks in boiler setting, &c.	20%
Loss in exhaust steam	9%
Total loss	93.7%
Useful work.	
Driving machines (butter churns, &c.)	1.0%
Pasteurising cream	1.6%
Heating milk for separating	0.7%
Heating starter milk	0.2%
Heating washing water	1.8%
Steaming churns and utensils	1.0%
Total useful work	6.3%

In the test summarised in Table IV, out of a total of 13,500,000 B.th.u. consumed, only 850,000 B.th.u. was usefully employed or, say, 300 kWh (allowing 84 per cent. efficiency).

The farm boiler is much less efficient even than the creamery boiler because it is smaller, its hours of use are shorter, and usually no power steam is used. Therefore, it should not be a difficult matter to provide the heat requirements of the farm dairy at a cost which would encourage the farmer and be profitable to the supply authority.

It has already been shown that all utensils which have been in contact with the milk must be cleaned immediately after each milking. The correct procedure is:—

(1) Wash thoroughly with *cold* water;
(2) wash and scrub with hot water to which a little washing soda has been added.
(3) rinse in clean hot water;
(4) sterilise with steam.

The quantity of hot water required will depend upon the number of vessels to be washed, and therefore upon the head of stock. The particulars given in Table V may be taken as a guide.

Table V.—*Utensils used and Hot Water required per Milking for Various Dairy Herds.*

No. of Cows in Herd.	Milking Pails.	Receiving Vat.	Milk Cooler.	17-Gal. Churns.	Gals. of Water @ 195° F.	Gals. Capacity of Electric Storage Heater.
10	2	1	1	2	15	17
20	3	1	1	2	20	22
30	4	1	1	3	25	27
40	6	1	1	4	30	33
60	8	1	1	5	40	44

The most economical method of providing the hot water is by the use of storage heaters such as have already proved so successful in many towns. The appropriate standard size is stated in the last column in Table V.

It is customary to milk twice a day (though in some herds three milkings per 24 hours are found desirable), and it is probably unnecessary to point out that the dairy herd as a unit knows nothing of the 5½-day week! There is thus a definite all-the-year-round demand for hot water. What this represents in annual consumption and load factor is shown in Table VI.

Table VI.—*Consumption (kWh per annum) and Annual Load Factor of Farm Dairy Water-heating Load.*

No. of cows in herd.	Heating load, kW.	kWh per 730 milkings.	Annual load factor.
10	1.0	5,400	61%
20	1.4	7,300	59%
30	1.7	9,100	61%
40	2.0	10,300	60%
60	2.8	14,500	59%

The loadings stated for the water heaters are those usually standardised for domestic supply and in really efficient heaters will raise the temperature of the full storage capacity from cold to 195 deg. F. in 8 hours.

It will be seen that on this basis the water-heating load provides an average load factor of 60 per cent.

Moreover, the usual farm maximum demand will not be increased, as the motor load on any dairy farm will be more or less proportional to the head of stock, and in all cases will exceed the demand due to the water-heating load. The incidence of the latter load can be adjusted either by time switches, current limiters or differential switching. (In this connection the Willesden system of combining water-heating and other loads, recently developed so successfully by Mr. A. W. Blake, will be worth consideration.)

The milking times vary according to local conditions, from about 5 a.m. to 7 a.m., and from, say, 3 p.m. to 5 p.m., the washing-up being done immediately after milking, or, say, from 6 to 8 a.m. and from 4 to 6 p.m. There is thus an interval of 14 hours overnight and 10 hours during the day in which to heat up a further supply of hot water. (Of course, in the case of some modern farms, where herds of heavy milking strains of Friesians or Ayrshires, for example, are kept and three milkings per 24 hours is the rule, the consumption will be increased approximately 40 per cent., and the load factor will improve to about 70 per cent.)

In addition to the water heater for dealing with the utensils, it will usually be of great advantage to the farmer to install a smaller heater in the cowhouse itself, or near to it, to supply hot water for washing the udders of the cows and the hands of the cowmen. This heater will also supply hot water for mixing calf foods and hot mashes. Hot water is also of great value for the incidental veterinary work which falls to the cowman as unfailingly as running repairs pursue the motorist.

The saving in labour and the greater convenience of an automatic hot-water supply make happier cowmen, and therefore contented cows; every farmer knows that contented cows give a bigger milk yield and consequently a larger revenue. It must never be forgotten that the farmer is a sound economist, and will appreciate definite figures. Probably no easier introduction is possible at the present time than an attractive scheme of hired-out water heaters with electricity at a reasonable price which the load justifies. The hire scheme would appeal to farmers because it would save them outlay and afford the possibility of increasing the size of heater as the herd increased.

There are at present about 2,000,000 milch cattle in England and Wales. Taking an average of 40 head per herd (probably a figure much too high), a total possible consumption of 500,000,000 kWh per annum is indicated for washing-up water alone. At one penny per unit, the cost to the farmers would not be much greater than the loss they suffer through sour milk, while they would gain by reduced labour and increased convenience.

Important as the water-heating load is in itself, it has several important advantages in connection with the general economy of rural electricity supply. These, however, cannot be dealt with on this occasion.

Electricity Propaganda.

A road train adopted by the Nord-Lumière Electricity Supply Co., Paris, for demonstrating the use of electricity for domestic and agricultural purposes.

By THEODORE RICH.

THE problem of the reduction of electricity supply costs in urban and rural districts is greatly influenced by the number of consumers in a given area and by the hours per day during which current is used. It is of great importance, therefore, to educate existing customers regarding the uses of electricity and to bring new ones into the fold.

In different countries different means are popular to this end, but perhaps one of the best methods is ocular demonstration brought, as it were, to the consumer's door. In this connection a scheme adopted by the Nord-Lumière Company, which supplies a large mixed urban, suburban, and rural area to the north of Paris, is of interest, although in this country certain conditions would require modifications before such a scheme could be put in operation.

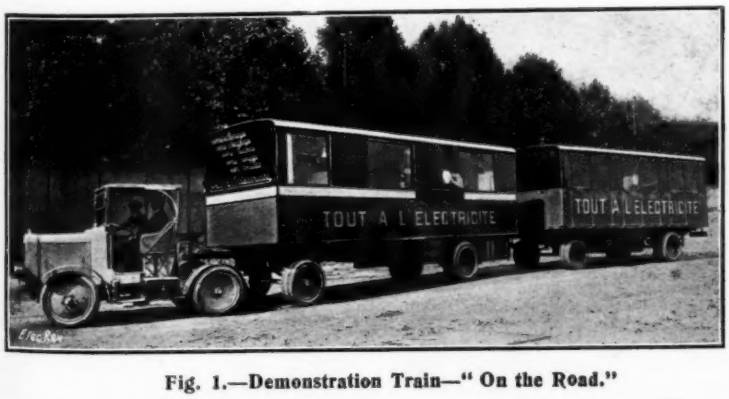


Fig. 1.—Demonstration Train—" On the Road."

The Company, in order to avoid the cost entailed in organising separate local exhibitions, has fitted up two demonstration vans, mounted on pneumatic tires, which, drawn by a petrol tractor, form a road train, fig. 1, which travels from place to place. These vans were shown to the members of the Union Internationale des Producteurs et Distributeurs d'Electricité during the recent congress. One van is devoted to domestic propaganda and the other to agricultural matters. In the denser suburban areas and industrial centres where there is little interest in farming, the domestic van only is used, but in the agricultural districts and in comparatively big towns where farmers congregate, the rural appliances coach is taken as well. The agricultural vehicle is designed something like the A.S.C. portable workshops used during the war in France. In order to get the best advantage out of the demonstrations, an itinerary is worked out well in advance of the tours, and a representative is sent on ahead to arrange the minor details.

The train stops a few days in each place, and where possible a fête day, market day, or agricultural-show day is covered. About a week in advance invitation cards are sent out to various prominent local people, notices are inserted in the local Press, posters giving the necessary details are put up, and town criers proclaim the coming event at street corners. Where individual villages are too small to allow of special visits, a convenient centre is chosen, and the leading inhabitants around are communicated with.

Arrangements are made in advance for the placing of the vans at convenient points as regards electricity supply and public attendance. In many cases low-pressure overhead lines are tapped by means of temporary clips on bamboo poles, and arrangements are

sometimes made, in cities, with important consumers for taking a supply from existing service connections by means of temporary leads from the fuse box. The local theatre is sometimes the means for such a connection.

Water is an important point; a temporary connection is made to a stand pipe, or, by means of a portable electric pump and suction and delivery hose, a supply is taken from any source of potable water.

There are three systems of supply available in the area of the Company —3-phase, 115 to 200 V; 220 V, 2-phase; and 220-380 volts, 3-phase; all 50 cycles. The demonstration apparatus is arranged for operating at 115-200 volts, and on each van there are two transformers, one for reducing the 220-380-V supply, and a Scott-connected transformer for dealing with the 2-phase supply. The three sets of intake terminals are kept well clear of one another, the neutral is put to earth, and there is a meter on each van. The chief of the train staff is an agricultural engineer trained in the use of electrical appliances, who can therefore lecture, discuss, and demonstrate on farming machinery and problems as a practical man. He has his programme given him, but otherwise he manages matters himself. His assistant is a chauffeur who helps to install material and undertakes small repairs, and so on. There is also a lady cook-housekeeper demonstrator, who shows visitors how to roast, grill, iron, and so on electrically. When the train arrives at the point where it is to stay, one or two of the local electricians of the Company come and lend a hand, and in many cases it takes no longer than half an hour to reach the demonstrating stage. The Company has six area sub-agents (employés of the Company), each of whom has control of a light van containing hot plates, fans, suction cleaners, and so on; as far as possible the agent or a representative attends and gets the addresses of people showing special interest in any of the appliances, with a view to demonstrating their use later in the consumers' own homes. A lecture with films is usually arranged on the first evening of a stop at some local hall, so that on the morrow members of the audience can go to the van and see the use of the appliances demonstrated. The Company is willing to arrange for the hire-purchase of appliances, and after a demonstration an area agent is empowered to leave an appliance with a customer on sale or hire-purchase at monthly or quarterly payments.

Fig. 2.—The Kitchen, Looking Aft.

In some cases with domestic apparatus, where existing outlets are not available or convenient, the Company, on the consumer's undertaking to make regular use of the appliance, is willing to wire up one or two plug points free of charge.

The domestic van is arranged in three sections—the kitchen, fig. 2, salon and bath room. In the kitchen is to be found a cooking range, an oven standing on a slab, a griller, coffee grinder, hot-water cylinder with sink and taps, a washing machine, a refrigerator, and a pressure pump drawing from a tank below, which starts automatically and keeps a certain head on the hot- and cold-water taps, thus demonstrating how wells can be treated when there is no water company. There are also a kitchen cabinet, some hot plates, an electric iron, and an electric fan to take away the smell of cooking. In the centre compartment, the salon, fig. 3, is a number of small domestic appliances, a suction cleaner, a floor polisher, a radiator, a sewing machine, a toaster, a hair dryer, a hair curler, an ozoniser for a sick room, a bed warmer, a hot rug for the feet, an electric phonograph, and a table pannikin for a child's food. The bath room has a bath and lavatory basins and an electric geyser arranged to show that a large space is not necessary. The interior is suitably lighted.

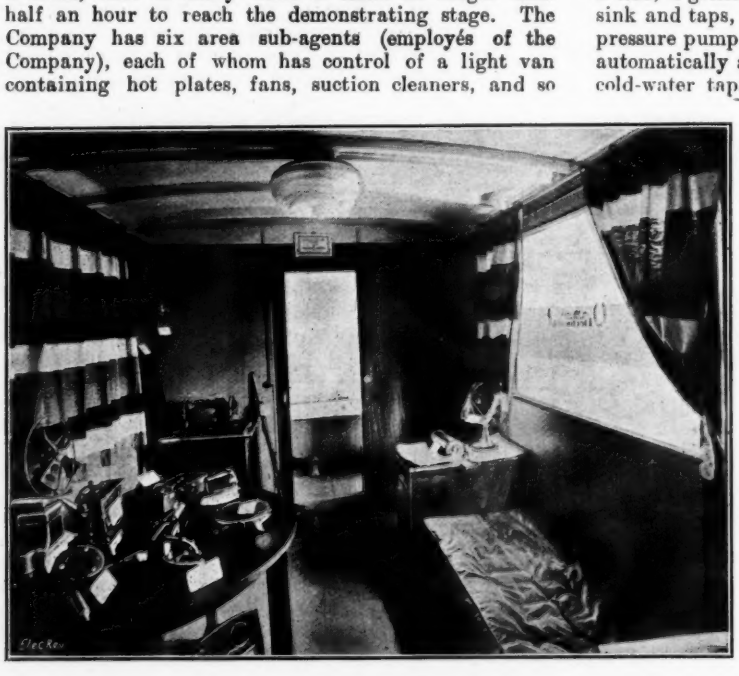


Fig. 3.—The Salon, Looking Forward.

Fig. 4 shows the agricultural van opened out; the upper parts of the sides lift up so as to provide a shelter, while the lower parts drop down, forming an extended platform, which is supported by adjustable tubular props. The visitor enters the vehicle by one set of steps, walks round, and leaves by another set on the other side. Opalescent bowl lighting fittings are provided in the roof. This van is also divided into three sections—the dairy, animal-food preparation department, and repair shop. An electric milker can be seen on the left of fig. 4. The equipment also includes a cream separator, a butter churn, and a butter worker

driven by a portable motor on an adjustable tripod. In the centre portion is an electric eight-hour storage heater for preparing cattle foods, a cattle-meal grinder, a cattle-cake breaker, a chaff cutter, and a beet and turnip cutter. There is also a motor on a barrow having a five-speed gear box with a pulley and a cardan shaft. In the repair section is a circular saw, with a turn-up table, a fire-log cutter, two grinding wheels, and an electric drill. A sheep shearer is arranged so that a sheep can be brought alongside and sheared there and then. There is also an electric run-way, by means of which machines can be lifted off the van. Some of the tools are shaft driven, while others are directly driven.

The apparatus is demonstrated to the local contractors, through whom customers are at liberty to buy any of the appliances. The vans started regular work in April last, and have been much appreciated; in some places as many as 3,000 people have visited them in one day.

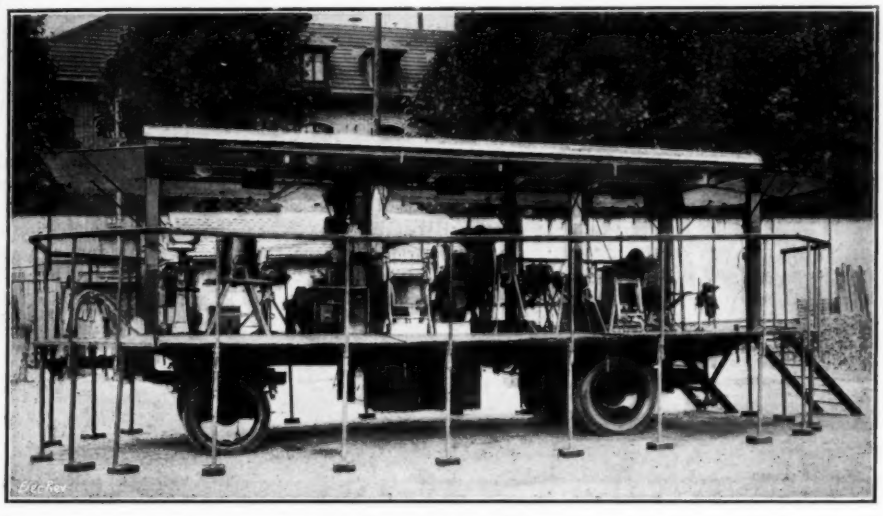


Fig. 4.—Agricultural Van.

At home it might be well possible for some local authorities to group themselves on co-operative lines to use some sort of a demonstration train in turn. Several of our power companies are quite as well able financially as the Nord-Lumière to equip a couple of vans on similar lines. Further, some sort of co-operating scheme might be arranged with the contractors. But there is the point that if it costs too much in capital outlay, due to over-stringent regulations, to take electricity to the villages, then no number of demonstration vans will do much good towards rural electrification.

The thanks of the writer are due to the Nord-Lumière Company for facilities to inspect the train, for the photographs supplied, and for the long interview given to him at the offices of the Company in Paris. The question whether a supply authority shall or shall not supply fittings, &c., on sale or hire-purchase must of necessity depend largely on local circumstances. The Nord-Lumière Company has adopted the policy of direct dealing, because it says that it wants to sell more electricity, and that in some parts there are no dealers, and electrical contractors have not pushed the sale of appliances as they might have done; and further, most of them have not the capital to undertake the handling of domestic or farm apparatus by instalments. In some parts of France and of the Continent the power supply people handle everything through contractors; many power companies abroad are direct or indirect offshoots of gas companies, and it is not unusual for gas undertakings to "carcase" new buildings and to handle stores with prices to the public lower than those charged by ironmongers or builders.

Some manufacturers and others object to the handling of motors, fittings, &c., by power companies on the ground that it tends towards monopoly-mongering and favouritism where any particular make is concerned.

It cannot be denied that a supply authority has a much easier access to a potential purchaser than the average wiring contractor; and if the former, after a telephone conversation or following the local visit of a demonstration train, calls with a van with samples of hot plates, flat irons, kettles, suction cleaners, and so on, and demonstrates their use, there are many opportunities of effecting sales. The house-to-house canvassing with suction cleaners by commission agents of little standing annoys some people, and makes some of those who are afraid of house pilferers somewhat suspicious; there is nothing, however, to prevent an enterprising contractor from fitting out a light van or an interchangeable van body with pigeon holes for a series of fittings and then calling on power users and demonstrating their advantages on the spot.

The road train is a child of the demonstration railroad trains for agricultural encouragement used in America, but being able to go to the village green or market square it attracts people who might not go to a railway station, and also those who would not in the ordinary way venture into an electrical contractor's show-room for fear that they might be pestered to buy.

Notes on the Cooker Load.

The Author gives the Results of Recording-ammeter Tests in a Private House.

By R. H. RAWLL, A.M.I.Mech.E., A.M.I.E.E.

THE last few years have shown a very rapid increase in the consumption of electricity for heating, cooking, and other domestic purposes apart from lighting. This has presented supply engineers engaged in distribution work with several new problems. Where a new residential network is being laid out, it is not only a wise policy from the technical point of view, but also sound business to put down cables of a section which is considerably greater than appears to be immediately necessary. In those cases, however, where existing networks are of comparatively small section, having been designed originally for lighting only, the balancing of services becomes very important if excessive voltage drops and fluctuations

are not to be experienced. The latter point is one which very vitally affects the development of the cooker load. The declared pressure must always be available at the cooker terminals. Now, the heating effect depends upon the square of the current, and therefore any reduction in voltage below the 4 per cent. allowed by the Electricity Commissioners will cause the cooker to become very inefficient. This is due to the lack of heat making it necessary to spend more time in cooking

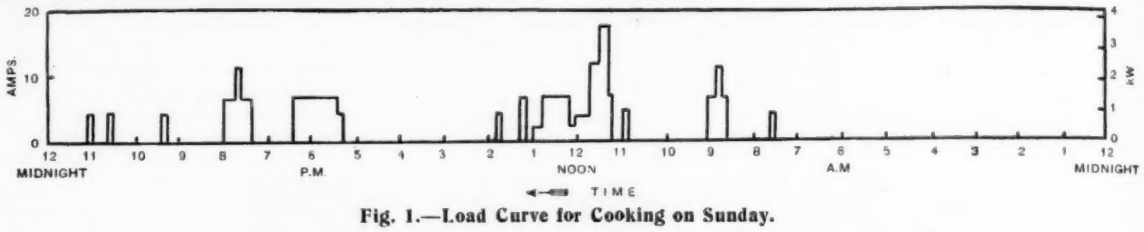


Fig. 1.—Load Curve for Cooking on Sunday.

(particularly is this so with the boiling plates, which are the most frequently used parts of the equipment), which not only is a source of dissatisfaction and annoyance to consumers, especially if they are new converts to the electrical method, but also leads to unnecessarily high consumption and, consequently, inflated bills.

In order to obtain a fairly respectable working balance on a length of residential distributor, most supply undertakings now keep some form of card system which shows at a glance the installed load of each consumer and to which outer (or phase in the case of a.c.) it is

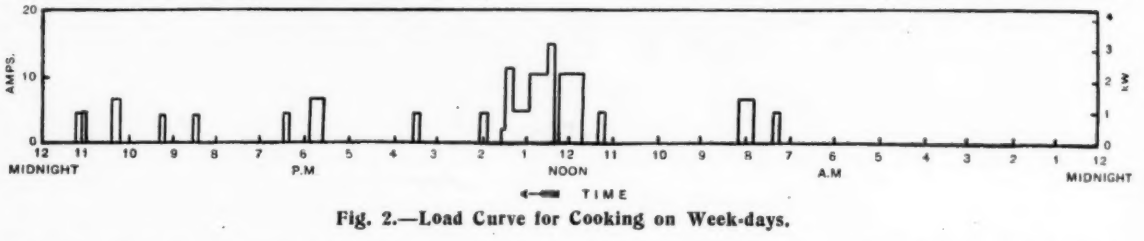


Fig. 2.—Load Curve for Cooking on Week-days.

connected. This is, of course, a paper load, and does not give any indication of the average load and the time, duration, and amount of maximum demand of any individual consumer, which, after all, is the information which really matters. It is realised that these particulars vary throughout the year according to the seasons, weather, and habits of consumers, but the author considers, nevertheless, that if a little more thought and attention were given to the factors involved in this problem it would be possible to record information of considerably more useful and practical value, from a balance and loading point of view, than is at present the case.

The main subdivisions of the domestic load are heating, lighting, water-heating, and cooking. The heating load of a consumer can be roughly determined by a consideration of the size and number of radiators employed, and the nature of the rooms in which they are

esting curves have from time to time been published showing either the daily load at various seasons of the year and days in the week of a sub-station feeding a residential area, or else the total daily load of an all-electric house, but very few have appeared pertaining to the cooker itself.

In order to obtain some first-hand information on this subject, the author installed a recording ammeter in circuit with the cooker in his private house. The instrument remained in position for several weeks, and records were taken on week-days and also at week-ends. No restrictions were imposed on the use of the cooker, the ordinary domestic routine proceeding quite normally.

The cooker equipment consisted of:—

		Watts.	
Cooker	Enclosed hotplate with 3-heat control	1,500	
	Enclosed hotplate with 3-heat control	1,500	
	Grill with single heat control	1,600	
	Oven (side heat) with 3-heat control	2,300	Watts.
			6,900
3-pint kettle			1,000
	Total ...		8,000 (approx.)

The supply is 220 volts direct current. It may also be as well to mention that the whole of the cooking is

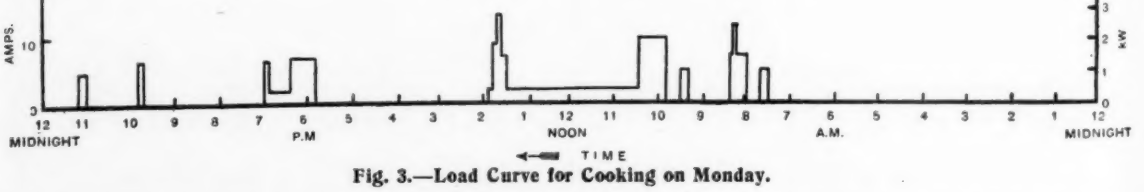


Fig. 3.—Load Curve for Cooking on Monday.

fixed, due regard being taken of the seasons and whether they supplant or supplement other forms of heating. In residential areas where electricity is used for a variety of purposes, the lighting load is practically negligible compared with the other loads, and, in any case, can easily be worked out from a knowledge of the average lighting requirements of a house in conjunction with the varying hours of darkness throughout the year. The water-heating load is a comparatively easy one to ascer-

done with the above equipment, the house being all-electric with the exception of an occasional coal fire (for psychological reasons only) in the winter, and a gas wash-boiler in the kitchen. The average weekly consumption for cooking purposes is 36 kWh.

A typical curve for a Sunday is shown in fig. 1, and that for a week-day in fig. 2.

The peak load occurs at midday at approximately the same time on week-days as on Sundays. This is what

one would expect, because a fairly large meal is usually prepared at such a time on Sunday? It may be argued that some people have their principal meal in the evening each day. Even so, in the average household with children going to school, a substantial meal is cooked at midday.

At one time, apart from lighting, the load on a residential network was practically nil on a Sunday. Nowadays, however, the maximum load of the week occurs on this day, with a peak load at about noon.

In fig. 3 is shown a typical Monday cooker load curve. This is usually "cold meat day," and accounts for the reduction in use of the cooker for the midday meal.

From the curves it is interesting to note the frequency with which the electric kettle is used throughout the day. This is, of course, the correct procedure, all plain water-boiling being done by the electric kettle, in preference to the use of utensils on the hot-plate. (Incidentally, the wife of the author, on being shown these curves, suggested that it was a subtle method of finding out how many times during the day she made tea!)

Another interesting point is that the maximum load is in the region of 4 kW, which is only 50 per cent. of the total loading of the cooker equipment. This seems somewhat surprising at first, but a little consideration will show that with the exception of the times of heavy duty, such as at Christmas, the oven is hardly ever at full heat at the same time as both hot-plates are in a similar condition. This has a direct bearing on the size of wiring necessary to feed a cooker. Where new wiring has to be run, at least 7/.036 (assuming a supply voltage in the region of 220) should be used, and larger sizes than this may be necessary to prevent voltage drop if a long run is involved. But it sometimes happens in some houses, and particularly in flats, that if there is a possibility of decorations having to be disturbed in order to install new wiring, this means a lost order for a cooker. In such cases existing wiring, which at first sight would not appear to be adequate to take a cooker load, might possibly, in view of the foregoing, be utilised with perfect safety.

In conclusion, the author realises that the above tests are only of an individual character, but experience shows that they are fairly typical of the average middle-class household where electric cooking is employed, and he hopes that, at least, they will be instructive and of some value to his fellow engineers engaged on the same problem.

Earth or Insulate?

A consideration of some aspects of the safe use of domestic electrical apparatus, in view of the interest that is being displayed at the moment in the revival of the advocacy of the universal earthing of appliances.

By T. C. GILBERT.

(*Concluded from page 394.*)

There are other objections to earthing which might be urged, chiefly with regard to its unreliability. The old objection that earthing a conduit shortened the life of a cable by subjecting it to a constant strain to earth cannot stand in these days of practically perfect cables and wires; in any case, we are not concerned with the earthing of conduits, which cannot be objected to on any grounds, but rather advocated, if they are used.

There are some points that *must* be earthed; for instance, the water-heater over the bath, and the washing machine—but do not let it be done by means of flimsy wires; good, sound water-pipe connections are needed in both cases, making the washer more or less a fixture. All other apparatus, such as kettles, vacuum cleaners, &c., will probably be supplied and earthed by means of 3-core flexible leads, and this is where unreliability commences. All engineers know how conductors in flexible cords are liable to break, and why should it not be the earth wire first? If it is, the apparatus will still work, and safety will be assumed, a state of affairs surely worse than knowing of a risk Reliance *cannot* be placed on a few strands of flexible conductor when human life is concerned. Many accidents have occurred with apparently earthed apparatus, and experience shows that the earth wire really is more liable to fracture first owing to the fact that in most types of earthing plugs and connections it is more exposed, is more likely to be pulled tight than the conductor wires; also in many cases the earthing screw is rather inaccessible and is thoughtfully omitted by the mechanic, or he takes the screw right out and loses it.

Something similar happened in the case of Mr. Rawlings's own electric iron, and one may assume that things of this sort are more likely to be carefully looked after as regards fitting and testing when under his eye than in other domestic establishments; in fact, Mr. Rawlings may have fixed it himself! He will, therefore, admit the possibility, nay, the probability, of this happening in many cases. The old lady with her kettle in the garden now has 3-pin plugs and carefully earthed connections. I made them myself, but I am not satisfied that she is immune from accident. We must not forget the domestic appliances that will not bear earthing. Try and earth the average hair-dryer, or small electric fan, and they will pass out within a week. In fact, I believe a lot of these articles are sold with leakage to the frame already in existence; any attempt at universal earthing will effectively stop the sale and deprive the public of these useful articles.

Then there is always the risk of the failure of the main wire that earths the whole installation. In many cases it is run bare through damp cellars and too hopelessly small for any useful purpose. Corrosion is always liable to destroy it, or possibly the first good fault will blow it out with the fuses, and it will not be noticed and will not be replaced. I have seen two stout earth wires—they were certainly bare—corroded away within a few months, the fault being eventually traced to a small leakage from the electric *bell* system in the house, which travelled from a barrel push-button in a damp wall (when shall we get *both* contacts insulated on barrel pushes?) *via* the earth wire to another damp patch, providing sufficient electrolytic action to do the damage. In how many cases has that occurred and never been suspected, or discovered?

Especially is this a serious matter in the case of lead-covered wiring systems, as possibly between the break of the earth wire and its discovery sufficient time may elapse to permit of the destruction of sections of the lead covering, either by corrosion or by direct electrical fusing when earths occur. Thus, even when the earth wire is replaced, the earth connections may not be complete, and the old fool's paradise, which must by now be seriously overcrowded, comes into the picture again.

One could go on citing actual and possible causes of failure of earthing devices and also of wiring systems as regards earthing. Many contractors have come across

buildings in which the conduit has in some instances completely disappeared, leaving the wire lying in rust-lined tunnels; especially is this true of conduit buried in some forms of concrete. Again, how many of the lead-covered systems can be seriously regarded by the practical contractor as mechanically sound earthed systems, with their little tin boxes, tiny screws, and bonding clamps? Designers of some of these systems should see the average wireman with a big screw-driver doing his worst with their pet junction boxes. It is also well known that certain woods, such as very old oak, have a bad effect on lead-covered systems, an effect which appears in some cases to be entirely chemical in its action and unaffected by whether the lead is earthed or not; thus entire lengths of lead outer covering, on which we are relying for our protection, may completely disappear.

The inclusion of an earth wire inside the lead sheathing certainly adds reliability to these systems, but everything still depends on conscientious workmanship. The protection of the public must be completely independent of all these considerations, and should become more or less automatic by reason of the use of suitable apparatus. Even if completely earthed systems could be made compulsory to-morrow, which (as the Editors of the Electrical Review have often pointed out in footnotes to correspondence) can never be done, what about all the thousands of existing installations which would not comply? Are they to be left in a condition of absolute danger? Installations which are perfect from a constructional point of view, beautiful wood-cased installations erected years ago and better than very many erected to-day, if disturbed to install an earth wire would be spoiled without doubt; at the best they would become more or less patchy jobs. Talk to the owner about a complete renewal and he will have visions of a get-rich-quick scheme for somebody at his expense, and no doubt the conscientious contractor, E.C.A. and N.R.E.I.C. will be shown the door.

In connection with this vexed question of earthing, I find myself in complete agreement with the writer of a leaderette, in the July 13th issue of the Electrical Review, but I do not think with him that the risk is small; or, if it is, I think it will certainly increase, and we should tackle the matter without delay. If safety can be achieved easily, gradually and at no great extra expense—and I believe it can if we work along the right lines—why not do it? Do not let us be content with saying that electricity is no more dangerous than gas, or other things, but let us attempt the ideal of 100 per cent. safety.

Insulate Everything.

In my opinion the only way to ensure the safety of the public is to insulate everything. Gradual elimination of all metal in connection with electrical installations (excepting, of course, the conductors, but we can always cut these down to the minimum) will provide us with the means of making safe old installations as well as new, and the problems that confront us will be enormously simplified. Of what use is it talking to the public about earthing and why it is necessary when we cannot guarantee safety by means of it? Try to teach the public that all electrical metal is dangerous, and it will quickly see that switches, &c., are constructed of other materials than metal. Thus, safety will be gradually and completely achieved, urged on by that greatest of all forces, public demand.

Granted that with an a.c. supply the fire risk is greatly lessened, let us commence with the elimination of conduit, with all its iron boxes and earthing devices. A well-known method of wiring, tough-rubber-sheathed cables, will give us all the mechanical protection required, and if used in conjunction with 3-plate ceiling roses, will prove as easy to extend as a well-designed draw-in system. I do *not* propose to use the little junction boxes for the system, but to make no connections other than those easily accessible in the ceiling roses; in addition, I propose short lengths of screwed conduit run down brick walls to switch positions, not necessarily for further protection to the cables, but for ease in withdrawing for extensions or alterations.

Tough-rubber cable compares more than favourably with lead- or hard-metal-covered cables in respect of withstanding mechanical damage. If accidentally struck with a hammer, a not unknown occurrence during erection, tough-rubber cable will strike back, but lead and hard-metal cable will be ruined; there is also the great liability of the latter to kink, from which again tough rubber is free. We thus at one blow cut out earthing and condensation troubles; moreover, the system is completely universal, and can be used anywhere.

Coming now to switches, whether of the flush or surface type, there are already on the market good bakelite switches, brown or white as preferred, and neat bakelite surface plates. The same remark applies to wall sockets and plugs. Present-day ceiling roses are good, mechanically and electrically, and cannot well be improved, but I should like to see them also made of bakelite. It now follows naturally that we should use a bakelite lampholder, but we meet our first snag, because the lamp cap itself is brass; it must go, and be replaced with bakelite, or some other insulating material. As lamps used to be supplied capped with material other than metal, there appears to be no real reason why this practice should not be revived; earth faults, too, in lamp caps are fairly frequent.

Standard lamps need not be constructed of metal; equally artistic and efficient standards can be constructed of wood, possibly bakelite, and certainly many other compositions. Thus, another source of danger will be eliminated. Of course, one requires flexible cords for pendants and standard lamps, and I plead here, not for any drastic change in existing types, but just for better quality. Let cable-makers insulate flexible cords with a thin coating of tough rubber on each conductor, in place of the present flimsy vulcanised rubber which will not withstand any handling, the main insulator on most of the present-day "flexes" being the silk covering. Apparently pure rubber is not required to-day, so that quite a useful coating of tough rubber could be applied without making the "flex" any larger than at present, and it could then be braided with silk or cotton as usual. It is probably too much to hope that cable makers will resume the old 40-gauge strands, they certainly withstood use better than to-day's 36-gauge. With tough-rubber insulation, however, this point would not be so important, as "flexes" would not kink so easily, or bend so sharply.

I am bold enough to claim that I have so far outlined an installation that would be practically 100 per cent. safe, but I can imagine some one saying: "Yes, but it is only for lighting, and when he comes to appliances he will meet his Waterloo." Let me hasten to meet my doom.

Probably, equal safety could be achieved by installing a transformer to bring the voltage for lighting inside the house down to 50 volts, but when appliances have to be considered, together with heating, the large currents involved at such a low voltage introduce a serious fire risk, and this system cannot be considered a solution of the problem of public safety.

As has been indicated earlier in this article, certain apparatus must be earthed. Under this heading I would include water-heaters (large capacity), geysers, washing machines, and refrigerators, but these must be earthed by means of their feed-water pipes and not by wires or cables, which eliminates possible failures in that direction. The main switch and main fuse may also be iron-cased and earthed, but I should not consider failure to earth in this case as serious, as the public rarely handles those articles; in any case, the adjacent meter will probably not be earthed. All sub-fuseboards would be wood cased, with Home Office fuses to eliminate the fire risk, and, rather important, spare fuses clipped alongside, with the correct size of wire

therein. Iron-cased and earthed fuseboards seem to me to be a positive danger, as the public *will* handle them without opening the main switch in attempts to renew fuses.

Cookers would also be earthed, but by means of stout iron straps, and open elements would be discouraged. Radiators permanently fixed would be soundly earthed, not by means of thin flexible cords, but I would make no attempt to earth portable radiators; there are on the market many attractive radiators with the iron-work covered with vitreous enamel in various colours, which forms a good insulator. I would encourage their use and press for a similar finish for the useful bowl fire; no doubt many other equally good and artistic finishes, and many better, would be evolved so soon as the demand for such a type of radiator became really insistent. Needless to say, such radiators would have insulated switches, with no metal exterior whatever.

Coming now to a useful appliance that has been rather in the public eye lately in connection with electrical dangers, the vacuum cleaner, here again I do not anticipate any real difficulty in obtaining complete insulation. Many of the enclosed dust-bag types with a practically enclosed motor already come very near to this ideal, and could easily be completely encased in an outer cylinder of insulating material; there would be no metal on the handle or the switch. I would encourage the public to buy this type, and popular demand would lead other makers to follow suit.

I have no doubt that the demand would also produce fans and toasters with an insulating enamel finish—it might even be possible to treat existing stocks in this manner. Further experience with bakelite and other similar compositions will probably make possible the complete covering of the metal framework with this material, or, better still, their complete exterior construction of it, over a metal interior framework.

The real difficulty is encountered when considering irons and kettles, but the breakdown of the insulation of an iron element is extremely rare; certainly the metal-clad connector must go, for most faults occur in it, and with the substitution of a bakelite connector I should not consider that any risk worth guarding against existed in good-quality electric irons. Metal work likely to be handled could, however, be covered.

The kettle is, of course, the appliance most liable to suffer from insulation breakdown, due to its abuse, its use in the proximity of water, and the liability of water leaking into the element chamber. This could be partly guarded against by lining with some such material as porcelain or earthenware the actual water compartment, covering the exterior with the vitreous enamel previously referred to, and eliminating the metal connector. Demand would again produce, I think, a new type of kettle, constructed of something like porcelain, earthenware, or "Pyrex" glass, and our troubles would be at an end.

Conclusion.

When the slogan "No metal" is driven into the public mind, the demand for non-metallic appliances will certainly be met by the manufacturers, and in the meantime the movement will lead the public to treat all metal articles with a great deal of respect, thus going far to achieve our ideal of safety. Let E.D.A. and E.A.W. get busy with the "No metal" cry. I trust that my arguments have been so convincing that my fellow contractors will agree that perfect safety will be only a matter of time.

There is no comparison, to my mind, between the two ideals "Earth," or "Insulate." The insulated system seems to be the best all the time. Which would the average electrical man rather see his children handling—a metal hand-lamp, alleged to be safely earthed, or a Home-Office-pattern hand-lamp unearthed? In this connection it should be pointed out to the earthing advocates that in earthing the hand-lamp one may also earth the lampholder, or one may earth the wire guard, but one must not earth both, as, according to the Regulations, "A lampholder shall not be in metallic connection with the guard, or other metal work, of a portable lamp."

Our forefathers were wiser than we. We still use their ceiling rose practically as they designed it, their first switches were all porcelain, and we are gradually coming back to this. They were not bitten so badly with the craze for cheapness, and they studied "safety first"; they also used non-metallic lamp caps, which we must get back to, if we can.

At first sight it may appear that my suggestions are rather fantastic, and that my optimism regarding the supply following the demand is not justified, but a moment's thought will show that there is no real reason why the articles mentioned should not be manufactured as I suggest with, at the most, a very small increase over the cost of present-day appliances; certainly not as much as that of fitting 3-pin plugs and sockets, with 3-core flex.

I am convinced that safety lies along these simple lines: no drastic change of existing installations, as the insulated pattern of fittings can be installed in the ordinary way as renewals; no increase in the cost of the new installation, no engineering job in the drawing room, no freak systems which may or may not be safe as luck holds, yet safety will be attained.

I must again emphasise that I am writing only of domestic installations with respect to the proposals outlined. The factory and workshop installations must still be cast-iron as regards earthing, if not as regards system (for tough rubber is invading even these precincts which are considered sacred to conduit). There is no reason why the shops and business premises should not come into line with what I shall now call the safety installation, and no doubt it will eventually prove cheaper for them to do so.

Safety for the public, then, means "No metal," and it can be achieved simply and cheaply; what is equally important, we can start to achieve it right now.

Earthing Exposed Metal.

In a letter received as we go to press, Mr. C. Coppock, of London, directs attention to the importance of that clause in the I.E.E. rules which specifies the minimum size of wire which should be used for earth-connecting frames and covers of electrical equipment. He says:—

"That neglect to observe this rule may be a source of danger should be obvious, but its stipulations are so frequently ignored that I venture to illustrate its importance by quoting three cases which, among many similar ones, have come under my own observation.

Case 1:—A 20-h.p. 440-volt motor in a saw-mill had a copper wire of 1-18 s.w.g. attached to its frame for 'earthing' purposes. Testing through with a lamp showed an open-circuit on this 'earth' connection, and tracing this along it was found to have fused through where buried under a pile of sawdust and wood chips.

Case 2:—Also in a saw-mill; a 25-h.p. 440-volt motor frame was 'earthed' by a 1-16 s.w.g. cotton-covered wire running for about 80 ft. along wood partitions to a water pipe. Owing to an earth fault on the brush gear a fuse had blown, and the cotton covering of the earth wire was afterwards found to have been charred and burnt along almost its entire length.

Needless to say, the fuse which had melted was on the large side, but when is this not the case in a saw-mill?

Case 3:—A starter frame was earthed with a 1-18 s.w.g. copper wire clipped to the board carrying the starter. An earth fault occurred on the starter, and the board was found to have been set on fire by the overheated earth wire.

One further point: buried metal plates seldom provide a good earth connection. The contact resistance between plate and ground is frequently much higher than is anticipated. In one case which I can recall, a motor frame was earthed in this manner, and when a fault occurred the fuse did not blow, but the potential between the earth wire and adjacent ironwork was found to be nearly 100 volts."

The Bakers' Exhibition.

Notes on the electrical features of the Confectioners', Bakers' and Allied Traders' International Exhibition and Market.

FROM the electrical point of view, as compared with previous years, the Confectioners', Bakers' and Allied Traders' 32nd International Exhibition and Market, which was opened, as usual at the Royal Agricultural Hall, Islington, on Saturday last, and closes to-day, is somewhat disappointing. We refer particularly to electric baking. The exhibitors are decidedly fewer and there is not that note of optimism among the manufacturers and users of electrical equipment which has been so marked in exhibitions of the kind in recent years. Technically there is nothing wrong with electric baking; indeed, the ease of temperature control and cleanliness that are obtained are such great advantages over other methods that in many cases the modern one has been

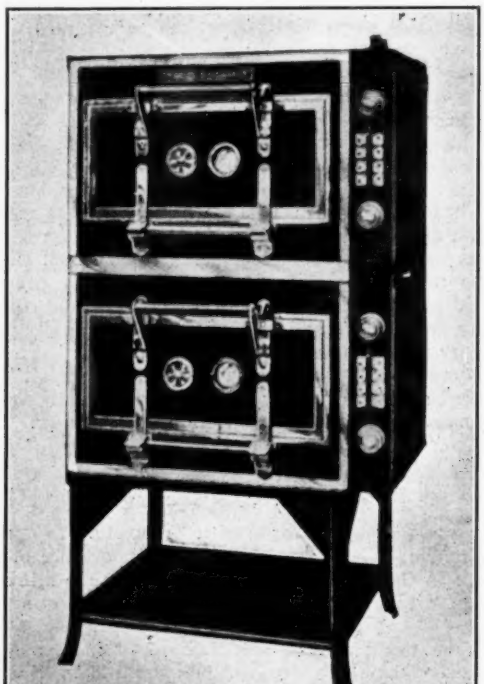


Fig. 1.—Two-Deck Electric Pastry Oven.

adopted, although economical considerations have been against it. Further, the development of industrial baking equipment may be said to have reached the same high standard as that of the domestic cooker. The problem is evidently for the supply undertakings (or the Electricity Board) to solve. Even where electricity is available at 0.5d. per unit, electric baking cannot be said to be generally competitive, and one hears somewhat disquieting rumours of electric baking having been given up after its installation, purely on account of its being uneconomic.

Among the few exhibitors of electric baking ovens is the GENERAL ELECTRIC CO., LTD., which is showing a number of items from the wide range of industrial cooking equipment manufactured by it. One of these is a double-deck "Magnet" electric baking oven of the "Peel" type. This oven, the internal dimensions of each deck of which are 4 ft. by 4 ft., is fitted with a tiled sole, the walls and crown being constructed of the best quality vitreous-enamelled sheet-steel. Tubular elements are fitted in the top and bottom of each oven in such a manner as to enable them to be withdrawn from the front. These are controlled by suitable switches, by means of which three degrees of heat in both the top and the bottom can be obtained, and pilot lights are provided to indicate which elements are on circuit at any time. Specially calibrated thermometers and interior illumination are also provided. A "Humidor" steam boiler is shown in juxtaposition with this oven. Steam is generated by using low-consumption heating elements, and by means of a patented system of atomisation it can be injected into the oven in adequate quantities at the exact stage in the baking operation to give the best results. A double-deck "Magnet" electric pastry oven, fig. 1, is also on show. The internal dimensions of each deck of this oven are 24 in. wide by 18 in. deep by 10 in. high. The oven is fitted with a tiled sole and has a vitreous-enamelled interior. Top and bottom elements are provided and are withdrawable from the side of the oven. They are controlled by suitable switches, which enable three different degrees of heat to be obtained at the top and bottom, and pilot lights are provided to indicate which elements are on circuit at any one time. Specially balanced drop-down doors are fitted, and also thermometers. A third exhibit to be seen on this stand is a "Magnet" electric doughnut cooker. This is constructed of sheet-steel and has a removable welded steel pan. A specially constructed basket, with a hinged wire-mesh lid half-way down, is provided for the purpose of keeping the doughnuts immersed during the process of cooking, and to ensure even browning.

Messrs. ARTOFEX ENGINEERING WORKS, LTD., are also showing and demonstrating electric baking equipment as part of a particularly interesting exhibit in the form of a complete all-electric working bakery and shop. A portable-type two-deck electric baking oven is shown by Messrs. BAKER PERKINS, LTD., and DAVID THOMSON, LTD. A feature of interest in connection with this is that the construction of the oven is practically identical with that of the makers' ordinary type of oven, provision being made, of course, for housing the elements, switches, and so on.

With regard to the power required in the bakery, electricity has, of course, long been established as the best method from all points of view. There are all sorts of such machines as dough mixers, cake mixers, and so on, at the exhibition, all electrically driven and practically all embodying the "built-in-motor" feature.

Among a variety of such machines on the stand of the PEERLESS ELECTRICAL MANUFACTURING CO., LTD., may be mentioned the vertical-type cake mixer shown in fig. 2. This is an 80- and 40-quart machine and is driven through special 4-speed gearing by a 3-h.p. motor which runs on ball bearings and is fan ventilated. Automatic lubrication is provided throughout. Single-phase and d.c. machines are supplied with a combined d.p. switch and drum-type starter, and 3-phase machines with star-delta starters.

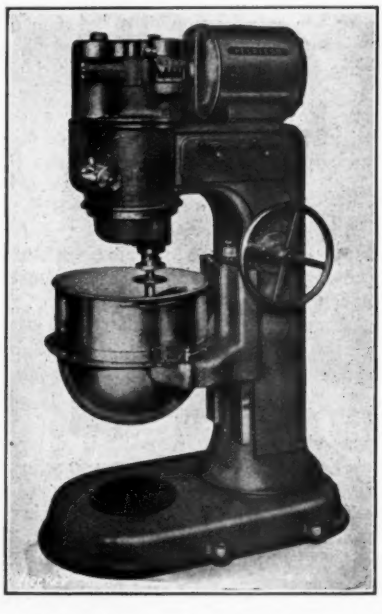


Fig. 2.—80- and 40-qt. Cake Mixer; 3-h.p. Motor.

An interesting machine may be seen on the stand of Messrs. MILKANIC, LTD. This is the "Milkanic" emulsor, which, it is claimed, produces cream from skim, milk powder, butter and water which cannot be distinguished from the natural product. This machine is made in three sizes, 1-quart, ½-gallon and 1-gallon, each of which is vertically driven by a small high-speed (5,000 r.p.m.) motor placed above the container. A recent development in connection with this machine is an arrangement to lift the motor from the "whisk" spindle when switching off, thereby completely breaking the drive, so that the mixing rotor is not lifted from its bearing, a practice from which deterioration has resulted.

The HOBART MANUFACTURING CO., LTD., has a very compre-

bensive range of electrical equipment on view, including dough and cake mixers, whisks, coffee mills, confectionery machines, dish washers, and so on, practically all with the driving motors as part of the structures.

An unusual item may be seen on the stand of the UNITED YEAST CO., LTD. This is a vacuum cleaner, "Salus Major II," specially designed for the bakehouse and shop. Briefly it is a vertically placed cylinder, on wheels, with the motor in the bottom portion and the container in the top. Two speeds are arranged for, 4,600 and 6,600 r.p.m. The motor is 1 h.p.

Among the usual variety of "Frigidaire" models to be seen on the stand of Messrs. FRIGIDAIRE, LTD., is an ice-cream freezer and storage cabinet. This houses a 2-gallon freezer and two ice-cream hardening and storage compartments, four gallons each. The freezer is operated by a model "K" ½-h.p. air-cooled compressor, automatically operated.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Factory Lighting Campaign.

The Factory and Workshop Lighting Campaign sales conference and demonstration for the London and Home Counties Area will take place at the Lighting Service Bureau, 15, Savoy Street, W.C.2, on October 5th. The principal speaker will be Mr. W. J. Jones. On the same day, or as near it as possible, conferences will be held in the following areas, the names of the speakers being given in parenthesis:—Scottish, Glasgow (Mr. H. E. Hughes); North-East, Newcastle (Mr. E. S. Evans); North-West, Manchester (Mr. R. C. Hawkins); North Midland, Leeds (Mr. V. W. Dale); South Midland, Birmingham (Mr. J. H. Cooper); South-West, Bristol (Mr. H. W. Lingard), and South Wales and Monmouthshire, Cardiff (Mr. G. S. Francis).

E.D.A. Conferences, 1928-29.

The British Electrical Development Association has arranged a further series of conferences to be held at the Royal Society of Arts during the coming winter season. The first will be on October 19th, when Mr. C. H. Cox (Edison Swan Electric Co., Ltd.), will occupy the chair, and Mr. W. Millner, B.Sc. (Westminster Electric Supply Corporation, Ltd.), will read a paper on "Organising for Better Selling in Electrical Showrooms." Mr. J. W. Beauchamp (South Wales Electrical Power Distribution Co.) will preside at the Conference on November 16th, when Mr. H. T. Young (Troughton & Young), will deliver an address on "Modern Lighting Designs for Domestic and Business Interiors." On December 21st Mr. J. E. Tapper (electrical engineer of Beckenham) will read a paper on "Hire and Hire-Purchase in Electrical Development Schemes," Mr. A. F. Harrison (City of London Electric Lighting Co., Ltd.) being in the chair. Subsequent conferences will be held on January 18th, February 15th, and March 15th, 1929, the respective subjects being "Electric Heating and Cooking Development," "Organising for Increased Sales—Spring Cleaning Season, 1929," and "Water Heating Development." The names of the speakers and chairmen for these conferences will be announced later.

Electrical Development in France.

We have received a collection of leaflets, &c., which are being circulated in Paris in the cause of electrical development. These are attractively designed and cover a wide range of electrical uses. The principal slogan employed appears to be "Soyez de Votre Siècle: Utilisez l'Electricité" ("Be Up-to-date: Use Electricity"), which might well be employed here in its English form. The pamphlets are, for the most part, the work of the Société pour le Developpement des Applications de l'Electricité, whose sign is "Apel," as will be seen from the card reproduced herewith. Among the matter are examples of consumers' meter cards (or booklets) which are used by the Parisian supply companies. The second illustration shows the back and front covers of one of these, issued by the Electricité du Nord-Est Parisien. The illustrations show various domestic appliances and their applications. Inside, in addition to six

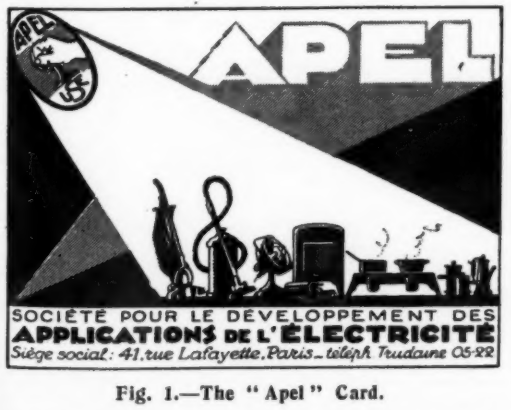

APEL
SOCIÉTÉ POUR LE DÉVELOPPEMENT DES
APPLICATIONS DE L'ÉLECTRICITÉ
Siège social: 41, rue Lafayette, Paris – téléph. Trudaine 05-22

Fig. 1.—The "Apel" Card.

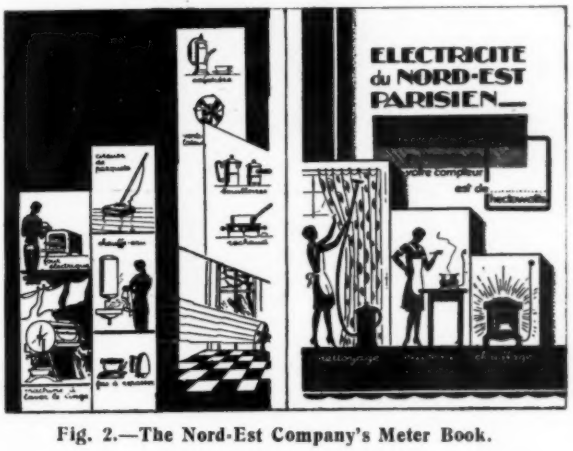


Fig. 2.—The Nord-Est Company's Meter Book.

pages for the entry of monthly meter readings, there are a number of hints to the consumer. These booklets stand in marked contrast to the meter cards which are usually employed in this country.

Siemens Bros. & Co., Ltd.

As we have received from a usual Continental electrical news source particulars of reports that have been in circulation in the German newspaper Press regarding the acquisition of an interest in Siemens Bros. & Co., Ltd., London (whose works are at Woolwich) by the Siemens & Halske Company of Berlin, we wish to place upon record a correct statement of the position. Before doing so, we may say that we are informed by our correspondent that an authoritative statement was issued by the publicity department of the German group correcting the German mis-statements, and showing that discussions were proceeding between the two companies with reference to the interchange of patents and the interchange of experience in certain technical branches in connection with arrangements concerning competition in the world market.

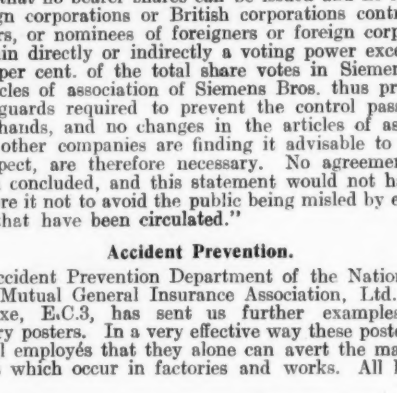
Apart from the foregoing reports, as the German statements regarding the relations of the two companies have since been re-echoed in a London paper, we have inquired of Messrs. Siemens Bros. & Co., Ltd., concerning the matter, and they have officially advised us that the facts underlying the rumours are as follows:—

"It is becoming more and more obvious that rapid development in every field of industry necessitates not only an ever-increasing application of research and development, but collaboration with leading manufacturers engaged in the same business. This especially applies to the electrical industry. With this end in view, Siemens Bros. have entered into discussions with Siemens & Halske, Berlin, for the purpose of attaining the above objects and for providing for an interchange of patent rights, thereby avoiding the risk of patent litigation between firms of similar names and which formerly had been closely connected. In these pourparlers the question of a limited mutual financial interest has also been discussed, on the fundamental basis that the identity and control of each of the firms shall remain undisturbed. In fact, foreign control of Siemens Bros. & Co., Ltd., is, in any case,

precluded by virtue of their articles of association, which provide that no bearer shares can be issued and no foreigners or foreign corporations or British corporations controlled by foreigners, or nominees of foreigners or foreign corporations, can obtain directly or indirectly a voting power exceeding *in toto* 25 per cent. of the total share votes in Siemens Bros. The articles of association of Siemens Bros. thus provide all the safeguards required to prevent the control passing into foreign hands, and no changes in the articles of association such as other companies are finding it advisable to make in this respect, are therefore necessary. No agreements have yet been concluded, and this statement would not have been made were it not to avoid the public being misled by erroneous reports that have been circulated."

Accident Prevention.

The Accident Prevention Department of the National Employers' Mutual General Insurance Association, Ltd., 10, St. Mary Axe, E.C.3, has sent us further examples of its cautionary posters. In a very effective way these posters teach industrial employés that they alone can avert the majority of accidents which occur in factories and works. All kinds of



An Accident Prevention Poster.

methods are adopted—the horrific, the humorous, the persuasive and the instructive among them. One of the humorous ones is reproduced herewith. Although it may be thought by some that the subject does not lend itself to such treatment, there is no doubt that the method is more likely to attract attention to the subject than glum lectures.

Met.-Vick. Awards for Papers.

The M.-V. Overseas Association, Trafford Park, Manchester, announces that to encourage the younger members the directors of the Metropolitan-Vickers Electrical Co., Ltd., have decided to award two prizes for what is considered the best technical paper read by a member under 30 years of age and for the best extempore speaker in the discussions upon papers. A senior member of the staff will attend the meetings with the object of reporting upon the proceedings to the Committee while the award of the prize for the best paper will be made upon the judgment of three departmental chief engineers. The prize for the best speaker will be awarded primarily on the vote of all members under 30 years of age, considered in conjunction with the reports of the senior men present. The prizes are each of the value of £5. A similar amount will be available for competition among members who are not at Trafford Park. The amount has been subscribed by certain of the members and will be awarded for the best paper by a member of any age which has been read before a regularly-constituted body or printed in the technical Press anywhere in the world.

Banking Assistance for Industrial Firms.

The relations of British Banks to British industry have formed the subject of more protracted discussion than any one other subject affecting the development of new and struggling businesses. The attitude of the big banks has been regarded at different times as obstructive to big business in various important overseas markets, and we have often failed to secure contracts because of the nurturing influence of foreign banks that was behind our foreign competitors. Other aspects of the question have been the need that many small manufacturing firms have experienced for financial co-operation on a reasonable basis and the want of financial organisations to assist businesses which are interested in hire-purchase schemes. We have had a number of applications for the names of banks or organisations undertaking this class of business and have recorded in these columns some particulars answering such questions. We are now informed that a new corporation has been formed by Sir Cassie Holden, Bt., of the Midland Bank, and Sir Philip Dawson, M.P., under the title the Industrial Discount Co., Ltd. The two gentlemen are among the directors of the company, which proposes to apply instalment purchase methods to industry and agriculture on a basis not hitherto attempted in this country. We understand that the distinctive feature of the scheme lies in its application to the sale of productive machinery rather than of the luxury articles which are commonly associated with the notion of hire-purchase. The question of financing extended credit facilities in order to assist our internal trade and agriculture was under consideration by the leading banks last year, and they then took the attitude that they were not in a position themselves to assume direct responsibility for such credits. It is understood, however, that the principles now adopted by the Industrial Discount Co., Ltd., have the approval of the banking authorities. The company introduced its new methods of credit to British industrial firms at the Machine Tool and Engineering Exhibition which opened at Olympia last week. The financing of hire-purchase business, both in its industrial and in its retail branches, has come to be regarded as a distinct and separate department which must be undertaken by a specialised organisation. The manufacturer has to produce: the dealer has to sell, and the finance company, with all the advantage of expert knowledge, can finance both. That, in brief, is the system of financial co-operation, which has been found necessary for the full inter-development of production and consumption. It is stated that as applied by the Industrial Discount Co., Ltd., the new system will cover on the manufacturing side the supply on monthly payments of agricultural and dairy machinery, workshop and factory plant, dental, medical and surgical appliances, garage equipment, and the fittings for retail shops. Practically every type of business will have an opportunity of bringing its equipment up to date without using its own capital. On the retail side, the credit inherent in the salaried middle classes will, so to speak, be exploited on new and scientific lines, so as to encourage the use of all the latest appliances, such as motor-mowers, electric washing-machines, vacuum cleaners, refrigerators, motor-cars and so forth.

International Telephones.

Advice from the other side states that on September 4th the Executive Offices of the Mackay Companies, the Postal Telegraph-Cable Co., the Commercial Cable Co., and the Commercial Pacific Cable Co. were removed from 253, Broadway, to the International Telephone Building, 67, Broad Street, New York City.

Bankruptcy Proceedings.

HARRY GATESHILL, 113, Witham, Hull, wireless engineer.—The receiving order herein was made recently on debtor's own petition. According to the statement of affairs there were liabilities of £229 and assets of £48. The first meeting of creditors was held on September 4th, at the Official Receiver's office, Hull. The following are creditors:—

	£		£
Cossor, Ltd., A. C. ...	20	Hobson, F. M.	50
Electron Co., Ltd. ...	25	Peto Scott & Co., Ltd ...	24

F. J. WELBERRY, The Beeches, Seathorn Estate, Skegness, electrician.—Receiving order made August 29th, on debtor's own petition. First meeting September 20th at the Official Receiver's office, 10, Bank Street, Lincoln. Public examination October 18th, at the Municipal Buildings, Boston.

S. PERKINS, 1, Lodge Lane, Beeston, Leeds, wireless dealer.—Receiving order made August 30th, on debtor's own petition.

J. H. GORDON, 21, Leeds Road, Ilkley, Yorks., electrical engineer.—Last day for receipt of proofs for dividend, September 21st. Trustee, Mr. H. C. Bowling, Official Receiver, 24, Lower Bond Street, Leeds.

E. R. D. LINDSAY, 96, Victoria Road, Aldershot, wireless and cycle agent.—Trustee, Mr. J. B. Rubens, 23, Surrey Street, Strand, W.C.2, appointed September 4th.

H. A. HYDE, 148, Weston Park, Crouch End, N., wireless dealer.—Application for discharge to be heard October 18th at the County Court, Scarbrook Road, Croydon.

Company Liquidations.

BURNDEPT WIRELESS, LTD.—A meeting of creditors was held on September 7th at the offices of Messrs. Binder, Hamlyn and Co., 80, Bishopsgate, E.C. The proceedings were formal, the company having gone into liquidation with a view to reconstruction, and a new company had been formed under the style of Burndept Wireless (1928), Ltd. The new company had a capital of £200,000, divided into 800,000 ordinary shares of 5s. each, and it acquired all the assets of the old concern, which at March 31st last were valued at £193,928, and consisted of patents, drawings, designs and goodwill £17,520, freehold and leasehold property £52,082, plant, fittings, &c., £11,321, stock and work in progress £42,571, sundry debtors £33,846, and cash in hand £36,588. The new company agreed to issue ten-year notes to the nominal amount of approximately £20,273, payable half-yearly, which were to be allotted amongst the creditors of the old company who were interested for amounts in excess of £10 each. The creditors were to receive notes equal in nominal amount to 50 per cent. of the amounts due to them. The holders of the preferred ordinary shares of £1 each in the old company were entitled to claim the allotment of two ordi-

nary shares of 5s. each in the new company, with the sum of 1s. 9d. credited as paid up on each share. The holders of the deferred ordinary shares of 1s. each in the old company were entitled in respect of every twenty such shares to the allotment of one ordinary share in the new company with the sum of 1s. 9d. credited as paid. The smaller creditors of the old company were entitled to a cash payment of 7s. 6d. in the £ in satisfaction of their claims. It was further proposed under the scheme that there should be an issue of 600,014 ordinary shares of 5s. by the new company, and the issue had been underwritten. The liquidator reported that the scheme had been approved by the creditors and shareholders, and a resolution was passed confirming the voluntary liquidation of the old company, with Mr. R. A. Hamlyn as liquidator.

BERRY'S ELECTRIC, LTD.—Winding up voluntarily. Liquidator, Mr. C. F. Saffery, 14, Old Jewry Chambers, E.C.2, appointed August 30th. The liquidator is "authorised and empowered to divide in specie all or any shares or other consideration received by him as consideration for the sale of the undertaking and assets of the company to Berry's Electric (1928), Ltd." A meeting of creditors is called for September 17th at the liquidator's office. (This notice is purely formal; all creditors have been, or will be, paid in full.)

MANCHESTER MAGNETO CO., LTD.—The statutory meeting of creditors was held on September 5th at the offices of Messrs. A. L. Price & Co., 8, Exchange Street, Manchester. Mr. A. L. Price, the liquidator in the voluntary liquidation of the company, stated that he had not had time to prepare a detailed statement of affairs. The meeting was therefore adjourned in order that the liquidator might submit a statement of affairs, and report on the position.

N.-K. BRADFORD, LTD.—First meeting of creditors September 18th at 33, Carey Street, Lincoln's Inn, W.C.2. Liquidator, Mr. E. T. A. Phillips, Official Receiver, Carey Street, W.C.2.

ASTON CROSS FOUNDRY CO., LTD. (also trading as "The M.A.P. Co.").—Liquidator, Mr. C. Hoult, Official Receiver, 191, Corporation Street, Birmingham, released August 24th.

Dissolutions of Partnership.

BREGA'S RADIO SERVICE, 305, King's Road, Chelsea, S.W.3. wireless engineers.—Messrs. D. C. Brega and A. J. Price have dissolved partnership. Mr. Brega will attend to debts and continue the business.

WHITLAM & PEARTREE, 2, Bank Street, Castleford, Yorks., radio and electrical engineers and dealers.—Messrs. M. E. Peartree and W. S. Whitlam have dissolved partnership. Debts will be attended to by Mr. Peartree.

Private Arrangements.

A. W. GILES, trading as Giles Bros., Thorpe St. Andrew, Norwich, wireless dealer, &c.—The creditors in this matter met recently, when a statement of affairs was submitted which disclosed liabilities of £1,423 and net assets of £878, leaving a deficiency of £545. The debtor started trading on his own account in March, 1923, having previously been in partnership with two brothers. He had a cash capital of £170, and stock worth £185. At the outset he was successful, but the business had fallen off. The present position was attributed to bad debts, and costs in connection with a motor accident. The debtor had recently entered into an advertising campaign in respect of a receiver. He had been in the habit of journeying to various places, and giving exhibitions. The stock included special wireless apparatus for exhibition purposes which cost about £250, and was now valued at £50. A resolution was passed in favour of the matter being dealt with under a deed of assignment, with Mr. W. A. J. Osborne, of Messrs. Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C., and Mr. Harper Smith, of Norwich, as joint trustees, while a committee was also appointed consisting of the representatives of the Red Lion Spirit Co., the General Electric Co., Ltd., the Marconiphone Co., Ltd., H. Thompson & Sons, Ltd., and Mr. E. H. Hawkins.

Scheme of Arrangement.

STILL ENGINE CO., LTD.—Separate meetings of the various classes of holders of debentures and shares are called for September 21st at 10, Victoria Street, S.W.1, for the purpose of considering a scheme of arrangement which will subsequently be submitted for the approval of the High Court.

Recent Contracts.

The YORKSHIRE COPPER WORKS, LTD., has received an order from the Sydney (N.S.W.) Municipal Electricity Department for cupro-nickel condenser tubes for the Bunnerong power station. The company has also recently secured important contracts from the P. & O. Co., the Canadian Government Merchant Marine, and from several large power stations.

Messrs. W. CROCKATT & SONS, LTD., Glasgow, state that they have recently supplied their patent electrical salinometers to the following authorities:—The Admiralty, for the "County" class cruisers and other vessels; the Australian Government for the *Australia* and *Canberra*; the builders of destroyers for the Argentine and Chilean Governments; the Southern Railway Co., for the s.s. *Worthing*; the P. & O. Co., for the *Viceroy of India*; the English Electric Co., Ltd., for the new Athens power station; Messrs. Preece, Cardew & Rider, for the Singapore power station; the United Alkali Co., Ltd.; Messrs. W. H. Allen, Sons & Co., Ltd.; and the London County Council.

The General Post Office has ordered a fleet of seven 15/20-cwt. electric vans for delivery service in the London area, with a charging station at Mount Pleasant, and three 20/25-cwt. vans for the Leeds area. The Leeds vehicles are being made by the ELECTROMOBILE CO., LTD., and the London vans by the VICTOR ELECTRIC CO., Southport. All the batteries employed will be of the "Kathanode" type, made by the D.P. BATTERY CO., LTD.

The Montreal branch of the HARLAND ENGINEERING CO., LTD., has secured the order for the electrical equipment to operate the lock gates and sluices of the Welland Ship Canal, Ontario, Canada. This important waterway was constructed to enable ocean-going shipping to avoid the Niagara Falls and pass through the canal to Port Arthur. The machinery will be made at the company's B.E.P. Works, Alloa, Clackmannanshire.

Book Notices.

The British Broadcasting Corporation has sent us a prospectus of the talks and lectures which are being broadcast during the period September-December. A wide field of interests is covered by the talks, and brief biographies of the speakers are given.

"Illustrated Technical Dictionaries in Six Languages—English, German, Russian, French, Italian, Spanish." Edited by Alfred Schlomann. Vol. II. Electrical Engineering and Electrochemistry. Pp. xii+1304. Distributors for Great Britain and the British Empire: Lewenz & Wilkinson, Ltd., 25, Victoria Street, S.W.1. Price, £4 net.

"Egypt and the Sudan" (72 pp.). Cairo: Tourist Development Association of Egypt.—This contains a number of illustrated articles on various aspects of the "unchanging East."

New Catalogues and Lists.

MESSRS. R. A. LISTER & CO., LTD., Dursley, Glos.—An illustrated brochure dealing with "Lister" auto-trucks.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—List No. 204—a catalogue of single, two-, and three-phase motors. Illustrations and full dimensions, &c., are given.

B.E.N. PATENTS, LTD., 92, Tottenham Court Road, W.1.—An illustrated and priced catalogue of car-washing plant, tire inflators, electrically-operated tools, and other products of the company.

Z ELECTRIC LAMP & SUPPLIES CO., LTD., 73, Newman Street, Oxford Street, W.1.—A useful booklet published in connection with the recent reductions in the prices of lamps. Particulars of all kinds relating to "E.L.M.A." lamps are given and the booklet contains a discount chart and ready reckoner. Also Price List No. 928 of wires, cables, tapes, &c.

VOLTA, LTD., 36-38, Kingsway, W.C.2.—Illustrated and priced leaflets dealing with the "Volta S.M. II" vacuum cleaner for factories, &c., and the "Volta V" small domestic pattern. Also the "Volta Viewpoint," the company's monthly sales magazine.

THE JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—September calendar-blotter bearing illustrations of the company's "Atom" fire. Priced. Also a series of illustrated and priced pamphlets dealing with the company's electric fires and kettles.

THE CELESTION RADIO CO., London Road, Kingston-on-Thames.—A priced folder illustrating examples of the company's loud-speakers and gramophone pick-up.

MESSRS. RD. JOHNSON, CLAPHAM & MORRIS, LTD., of Jacem House, Trafford Park, Manchester, are issuing to applicants a handy screw, nail and wire gauge, having a 3-inch rule along one side, divided into ½, 1/10 and 1/12 inches, and punched to facilitate attachment to a key-strap or chain.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2.—Two illustrated and priced leaflets dealing respectively with the company's new batteryless receiving sets and rectifying valves.

MESSRS. GENT & CO., LTD., Faraday Works, Leicester.—Section 10, Book 8, a leaflet illustrating and describing "Tangent" a.c. mains transformers for power amplifiers, and moving coil loud-speakers; and Leaflet 154E, advertising "Tangent" bells and sirens.

MESSRS. DAVID WILSON & CO., 40, Brazennose Street, Manchester.—A leaflet containing an illustrated description of the Fisher continuous drainer or condensate tap.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—A classified price list of Marconi valves, including new types for the forthcoming season.

MESSRS. RIPAULTS, LTD., King's Road, N.W.1.—A booklet "Light on the H.T. Battery," containing notes on dry batteries in general and the company's in particular.

MESSRS. VERITYS, LTD., Aston, Birmingham.—List No. 1049, containing illustrated particulars and prices of "Maxlume" industrial and commercial lighting equipment; and List No. 1052, dealing with the company's electric fires of many patterns.

MESSRS. CUNLIFFE, HILLSTEAD, MACDONALD & CO., LTD., 6, Duke Street, St. James's, S.W.1.—A pamphlet advertising the "No-Battery" self-generating electric torch. Priced.

THE ELECTRICAL EQUIPMENT & CARBON CO., LTD., 107-111, New Oxford Street, W.C.1.—September stock list of electric motors, dynamos, &c.

MESSRS. HEYES & CO., LTD., Water-Heyes Electrical Works, Wigan.—An illustrated pamphlet dealing with the company's "H"-type pendant lighting fitting. Priced.

MESSRS. WILLIAM GEIPEL, LTD., 156-170, Bermondsey Street, S.E.1.—An illustrated descriptive catalogue of steam traps of several patterns.

Trade Announcements.

Messrs. LEWENZ & WILKINSON, LTD., of Victoria Street, S.W.1, state that Mr. E. R. Wynne has resigned his seat on the board of the company and that Mr. Cyril W. Davson joined the board in February last.

Messrs. W. H. WILLCOX & Co., LTD., Southwark Street, S.E.1, state that their works will be closed to-morrow (Saturday) upon the occasion of a fête to celebrate their 50 years of business.

Mr. DAVID HAMILTON, B.Sc., 20, Budge Row, E.C.4, having joined the board of the British and Foreign Machinery Co., Ltd., has transferred to the latter the agencies formerly held by David Hamilton & Co., and the business is now being carried on at 148, Leadenhall Street, E.C.3.

The telephone numbers of the UNIVERSAL LAMP CO., 89, Great Eastern Street, E.C.2, have been altered to Bishopsgate 6777 and 6778.

Mr. F. B. OGAN, who, for many years was associated with Messrs. Veritys, Ltd., has joined the outside staff of the London Electric Wire Company & Smiths, Ltd., as representative in the London area.

Price Reductions.

The HART ACCUMULATOR CO., LTD., announces important reductions in the prices of its celluloid and glass box types of low-tension accumulators for radio work.

Electrical Equipment for a 20,000-ton Liner.

A special train load of electric propulsion equipment for the P. & O. Liner *Viceroy of India* recently left the Rugby works of the BRITISH THOMSON-HOUSTON CO., LTD. Two 40-ton well trucks were used for the transport of the rotors for the two propeller motors, and as these rotors measure 11 ft. 5 in. in diameter, the load was considerably out-of-gauge. The L.M.S. Railway Company had, of course, to make special arrangements to work the train to its destination, Messrs. Alexander Stephen & Sons, Ltd., Linthouse, Glasgow. The train left Rugby at 6.10 a.m. on September 2nd, and all trucks were ready for unloading on the 4th. The trucks were loaded to the maximum height of 13 ft. above rail level, and the extreme width of 11 ft. 5 in. occurred about 7 ft. 3 in. above rail level. In all there were 14 trucks of electrical equipment, weighing 152 tons, in this consignment. The total amount of electrical machinery which is being supplied from the Rugby works of the B.T.-H. Co. for this liner weighs over 400 tons.

A Power Station for Crete.

It is reported from Athens that the municipal authorities of Canea, Crete, have opened a competition for the establishment of a generating station for the supply of electricity to the greater part of the island. The station will be erected in Canea and the specification and conditions are available from the City Administration, Canea; offers are to be sent in by October 31st.

Social Event.

On Saturday, September 1st, the staff of Messrs. H. E. Ashdown (Birmingham), Ltd., had their annual outing to Bidford-on-Avon, where a most enjoyable time was spent. The party, numbering about 100, were taken in charabancs to their destination, and on arrival participated in river trips. After tea there were sports, at the conclusion of which a vote of thanks was passed to Mr. and Mrs. Ashdown.

American International Combustion Merger.

The International Combustion Engineering Corporation (United States), an associate of International Combustion, Ltd., has completed negotiations for the acquisition of the entire business and assets of the Hedges-Walsh-Weidner Co. of Tennessee and the Walsh & Weidner Boiler Co.

Preferential South African Duties.

The *Board of Trade Journal* for September 6th contained a list of tariff preferences accorded to British goods upon importation into South Africa. In many cases the whole of the duty is remitted; this is the case with electric lamps, except those of the radiator type, upon which there is a 5 per cent. *ad valorem* rebate from the maximum duty of 20 per cent., electricity meters, electricity generating, converting, &c., machinery, and lamp shades and reflectors. A 5 per cent. *ad valorem* rebate is made in the cases of primary and secondary batteries, except those with a single-cell capacity greater than 150 Ah (one-hour rating); and electric cooking and heating appliances, including kettles and irons, provided that the last are not for industrial purposes.

The European Aluminium Syndicate.

A period of nearly two years has elapsed since the European Aluminium Syndicate was constituted for a term of two years, so the agreement is now approaching an end. In the opinion of a German newspaper, however, it is certain that the syndicate will be continued and the constituents will shortly meet to decide upon the prolongation of the combination for a further year. The question is said to be merely a formal matter, as the members have no reason for desiring the arrangements to end. Above all the existence of the syndicate has had the effect of causing a reduction in the price of crude aluminium. Before the official announcement of the formation of the combination there was a fall in the European price from about £118 per ton to £105. It was originally proposed to adhere to the latter price for two years, but it was found impossible to do so and in May of the present year the price was lowered by £10. It is hinted that the renewal of the agreement may bring about a fresh concession in prices.

The T.U.C. and Industrial Peace.

During last week's Trade Union Congress at Swansea there was a lengthy debate upon the report of the General Council upon industrial relations and organisation. The leaders who had taken part in the conference between representatives of the large industrial employers and of the trade unions explained their attitude, and pointed out the advantage to organised labour of such conferences. The report was adopted by 3,075,000 votes to 566,000.

A New "J. & P." Booklet.

An interesting little booklet recently published by MESSRS. JOHNSON & PHILLIPS, LTD., while primarily intended to advertise the company's wiring system, is quite a good piece of general electrical propaganda. It is in the form of an illustrated dialogue at "Elmdene," which opens with a grumble by the owner about the inconvenience and dirtiness of gas lighting, followed by the departure of the servant on account of the lack of labour-saving devices at "Elmdene." A friend points out that electricity is not a luxury but a necessity, and soon after the master of the house calls in a contractor, who puts in a "J. & P." installation. The residents, of course, live happily ever after. The booklet also contains views of a number of large and small buildings in which the "J. & P." system has been employed. The publication is arranged for over-printing with a contractor's name, address, &c.

United States Foreign Electrical Trade.

The total value of electrical machinery, goods and apparatus exported from the United States during June last was $9,243,320, as compared with $7,663,154 in June, 1927. The item contributing the most to this increase was refrigerators under 1-ton capacity, which rose in value from $430,971 to $744,454. Other notable increases were recorded by the following classes:—Fractional h.p. motors, from $192,227 to $330,602; radio apparatus, from $600,094 to $721,690; batteries, from $673,721 to $783,453; and unspecified electrical apparatus, from $523,407 to $626,504. There were a number of decreases, but none was of substantial proportions. The figures for the first half of the current year show a total value of $53,257,075 as compared with $49,262,225 for the corresponding period of 1927. The most notable feature was an increase in the exports of refrigerators under 1-ton capacity from $1,707,603 to $3,200,202, making this the largest of the specified items.

Canada, as usual, was the principal customer during June, her share amounting to $2,412,075. Argentina, with $777,210, was second, and the following countries each imported goods valued at over $400,000:—United Kingdom ($733,042), Australia, Mexico and Brazil.

The United States' imports of electrical goods reached a value of only $202,481, of which over $100,000 represented lamps.

The Western Canadian Trade Commissioner.

His Majesty's Trade Commissioner in Western Canada notifies us that his offices have been removed to Credit Foncier Building, 850, Hastings Street West, Vancouver, B.C.

Unemployment.

There was an increase of 11,840 in the number of registered unemployed during the week ended August 27th. The total at that date was 1,320,000 as compared with 1,308,160 on August 20th, and 1,049,260 on August 29th, 1927.

Marconi Royalties: Announcement by the Company.

Last week Marconi's Wireless Telegraph Co., Ltd., announced its intention of appealing from the decisions of the Comptroller-General of Patents upon the applications of the Loewe Radio and the Brownie Wireless Companies' applications for special manufacturing licences under reduced royalties. The appeal lies to the High Court, from whose judgment there is no further appeal. The Marconi Company clarifies the situation by stating that if the decisions are confirmed by the High Court other manufacturers will be able to obtain licences on similar terms as from the date of the confirmation.

The decisions of the Comptroller-General were reported in our issue of August 31st (p. 354). Briefly, they provided for royalties of 7s. 6d. and 10s. respectively on the Loewe Company's double and triple valves, and for a royalty of 10 per cent. on the wholesale selling price of the Brownie Company's sets subject to minima of 5s. for the first valve-holder and 2s. 6d. for each additional valve-holder.

Although it appears from the foregoing that no agreement has been reached, the Brownie Co. has sent us a window bill bearing the following wording: "Marconi royalties reduced on Brownie valve receivers. Two-valve set (price). Royalty only 7s. 6d."

A general meeting of the members of the Radio Manufacturers' Association was to be held on Wednesday afternoon to

consider the position arising out of the Comptroller-General's decisions, and recommendations as to the future course of action were to be made.

The business according to the agenda was: "To receive a report from the chairman of the R.M.A. on the situation created by the Brownie case and subsequent abortive negotiations with the Marconi Co., and, in connection therewith, to consider and, if approved, pass the following resolution:—That this meeting of radio manufacturers having considered the effect of the decision of the Comptroller-General of Patents in the Brownie case and having received Counsel's opinion thereon, hereby resolve to act in accordance with Counsel's advice and apply to the Marconi Co. for a licence on the terms and conditions set out in the Comptroller-General's decision in the said case and, in the meantime, to operate under such terms and conditions notifying the Marconi Co. accordingly."

New Indian Companies.

Among the electricity supply undertakings recently organised in India are the Gaya Engineering and Electric Power Co., Gaya (Bihar and Orissa), capital 700,000 rupees; and the Banu Electric Supply Co., Banu (North-West Frontier Province), capital, 500,000 rupees.

Irish Free State Electrical Imports.

The imports of electrical goods, excluding machinery, into the Irish Free State during July last amounted to £33,038, bringing up the total for the first seven months of the year to £246,711, as compared with £212,783 in the corresponding period of 1927.

Swiss Electrical Exports.

So far this year there has been an active tone in the Swiss export trade in electrical machinery and apparatus, the shipments during the first half of the current year having attained a value of £1,362,320, as compared with £1,092,840 in the corresponding period of 1927. The details of the exports are shown in the appended table:—

	January to June. 1928.	1927.
	£	£
Electrical machinery	561,920	501,440
Electric locomotives	151,880	5,360
Electrical apparatus and instruments ...	510,920	496,840
Electric lamps	59,320	36,880
Telephone and telegraph apparatus ...	43,680	17,880
Electric cables	27,280	28,640
Accumulators	5,280	3,040
Miscellaneous goods	2,040	2,760
Totals ...	£1,362,320	£1,092,840

Spain and Japan are at present the best markets for Swiss electrical machinery; Spain for locomotives; France, England, Holland, Spain, Poland and Argentina for apparatus and instruments; Sweden and Holland for lamps; Peru and Italy for telephone and telegraph material; and France and England for cables.

Australian Industry and Tariffs.

The Canberra correspondent of *The Times* quotes from the annual report of the Commonwealth Tariff Board the statement that the high costs of production, which are one of Australia's most serious difficulties, appear to have been maintained. Australia is dependent on overseas markets, where the declining costs have increased the handicap. The tariff wall, adds the report, is markedly rising. In 1908 there were only eight items with *ad valorem* duties of 40 per cent. or more. In the present tariff there are 259 such items. In the manufacturing industries much of the high cost of production is due to over-capitalisation, high wages, short hours, and restriction of output. Requests for increased wages and better conditions of labour are not always based on sound principles. There is an apparent need for co-operation between the authorities fixing wages and those fixing the farmers' tariff. No doubt the tariff also has some influence on the high cost of production by making possible the maintenance of a high standard of living. The maintenance of high costs of production and distribution is alarming and demands co-operative effort to discover a remedy. Productivity must be the basis of all wages. If the joint efforts of employers and employés fail, it is worthy of consideration whether the Government should not fix the general maximum limit of tariff assistance which it is economically sound to give any industry, leaving the employers and employés to adjust the costs of production to a basis which allows successful competition with imported goods. Unless the costs of production can be reduced there is no alternative but to reduce the standard of living, which would be highly undesirable.

The Canadian National Exhibition.

The Canadian National Exhibition was opened on August 24th by Viscount Willingdon, Governor-General of Canada, this being its 50th anniversary. It presents many new features, the most important being the new electrical and engineering building just completed at a cost of $600,000. It is constructed of steel, artificial stone, and red brick, and architecturally is one of the most striking of the 99 permanent structures on the ground. It has 60,000 sq. ft. of floor space. The activity of the electrical industry is shown by the fact that with the exception of three exhibitors the entire space available for electrical displays, which is 60 per cent. of the total, has been contracted for a period of ten years. The number of exhibits is approximately 500, including every known type of electrical appliances and every variety of machinery in common commercial use. Numbers of the larger exhibitors will erect special booths and miniature buildings of their own inside the main building. The national radio show occupies a section running the entire length of the building. The electrical display is proving one of the most attractive features.

Important New York Merger Sanctioned.

The Public Service Commission of New York has sanctioned the merger arranged between the Brooklyn Edison Co. and the Consolidated Gas Co. of New York. As we have reported, the combination involves a total investment of $1,212,100,000, including outstanding bonds and the stocks of affiliated companies. The combined earnings of the two companies in 1927 were over $200,000,000.

For Sale.

Grimsby Corporation Electricity Department has for disposal one 500-kW generator set, condensing plant, switchboard, &c. The West Central Merchandise Mart will sell by auction on September 27th, at Red Lion Passage, Holborn, W.C., a large stock of cables and wireless goods. By order of the Air Ministry, Messrs. Fuller, Horsey, Sons & Cassell, will sell by auction, on September 25th, at the Baltic Exchange, E.C., surplus machinery and stores lying at the R.A.F. Stores Depot, Kidbrooke, S.E. Colchester Corporation Electricity Department invites offers for old cable. (See our advertisement pages today.)

Prices of Materials.

Messrs. F. Smith & Co. and Messrs. James & Shakespeare report, September 11th:—No change in copper prices.

Messrs. James & Shakespeare report, September 11th:—English pig lead £23 10s., 5s. dec.

Messrs. Edward Till & Co. report, September 11th:—India-rubber Para, fine 10½d., ½d. dec.

In their weekly lead report (dated September 8th) Messrs. JAMES FORSTER & Co. state that a very large business was done on the preceding Tuesday's market, the total quantity changing hands amounting to about 3,750 tons, chiefly for October shipment, although values were practically unchanged on the day, early lead being actually 1s. 3d. dearer. The heavy selling was generally attributed to the liquidation of the big "Bull" accounts of several thousand tons made in April. The fact that such heavy offerings were readily taken without any effect on values was indicative of the strength of the immediate position. The shipment from Australia in August of 14,531 tons against 7,100 in July will make the position in October more normal, but there is a prospect of continued short supplies this month. "Consumers, who have naturally been pressing for deliveries during the recent shortage are, as far as our experience goes, continuing to buy from hand to mouth, and in this we think they are right."

Lighting and Power Notes.

Aberdeen.—ELECTRICITY SUPPLY PROGRESS.—During the past year, electric lighting has been installed in 249 tenement dwellings under the Town Council's assisted wiring scheme. Councillor MacGregor, in moving the adoption of the electricity accounts at the last meeting of the Council said the result of the year's working indicated continued progress in the use of electricity within the Corporation's area; the sale of electricity now exceeded 32,000,000 kWh per annum, representing 192.6 kWh per head of population, as compared with 172 kWh in the previous year.

Australia.—SYDNEY (N.S.W.).—We have received from Mr. H. R. Forbes Mackay, general manager of the municipal electricity undertaking, a copy of his report together with the statement of accounts covering the year ended December 31st last. The total income amounted to £2,135,780, and working expenses were £1,359,058, leaving a gross profit of £776,722. The figures for the preceding year were: Income, £1,870,989; working expenses, £1,236,355; gross profit, £634,634. Capital charges absorbed the whole of the gross profit, and there was a deficit of £22,038, to which was added an adverse balance of £38,436 from the preceding year, making a total loss of £60,474. The capital expenditure during the year amounted to £1,991,277, and included £212,303 for machinery, &c., at Pyrmont and Bunnerong stations, £305,848 for sub-station machinery, and £805,661 for underground and overhead mains. The total now spent on the undertaking stands at £10,912,770. The electrical energy generated amounted to 219,772,900 kWh, and the quantity purchased from the Government Railways and Tramways Department was 115,863,392 kWh, making a total of 335,636,292 kWh, as against 291,427,580 kWh in the preceding year. The sales increased from 234,608,942 kWh to 277,744,342 kWh, and the maximum supply demanded from 80,700 to 93,000 kW. The total connections rose from 316,544 to 368,352 kW, and the average price obtained per kWh fell from 1.799d. to 1.761d. The total length of underground h.p. mains laid during the year to replace overhead h.p. mains was 88 miles, and the total length of l.p. overhead and underground mains, 64 miles. There was an increase in the mileage of street lighting mains of 29, making the total length 1,191 miles. Good progress was made during the year with the construction of the new Bunnerong power station.

Birkenhead.—LOAN.—The Corporation Electricity Committee is to make application for sanction to borrow £25,000 in respect of prospective unspecified works on mains and services for the Wirral scheme.

Blackburn.—NEW CABLES.—The Town Council has approved the laying of cables from Limefield to Revidge and Beardwood Brow at a cost of £6,900, and a cable from Yew Tree Drive to Lammack Road, at a cost of £7,600. Application is to be made for sanction to a loan.

BAKING TARIFF.—The Council has also approved a special tariff for industrial baking on the following terms, subject to a minimum installation of 10 kW and a guaranteed consumption of 2,000 kWh per quarter: ¾d. per kWh from 8 p.m. to 4 p.m.; and 1½d. from 4 p.m. to 8 p.m., subject to an emergency increase of 10 per cent.; and 9s. per quarter time switch and meter rent.

Bredbury and Romiley.—PRICE MODIFICATION.—The Urban Council has extended the scale of charges for electricity for domestic power as follows:—Not exceeding 6,000 units, 2d. per unit; exceeding 6,000 and under 8,000, 1¾d. per unit; beyond, 1½d. per unit.

Burnley.—ELECTRICITY SUPPLY.—The Corporation Elecfricity Committee has authorised application for sanction to borrow £1,250 for the extension of an existing e.h.p. feeder from Brunel Street to Whittlefield sub-station. An underground cable is to be laid from Holmby Street sub-station to Pendle Bottom at a cost of £1,300, and an overhead cable between Pendle Bottom and Quaker Bridge.

Buxton.—BULK SUPPLY.—The Town Council has decided to make application to the South-East Lancashire Electricity Advisory Board for its approval of a scheme for taking electricity in bulk from the Trent Valley and High Peak Electricity Co., Ltd., and to the Electricity Commissioners for sanction to borrow £10,500 for the necessary converting plant, cables, &c.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—The *Board of Trade Journal* states that power developments of considerable magnitude are in prospect both in Manitoba and Saskatchewan, made necessary by the steadily increasing industrial and residential loads. In Manitoba the City of Winnipeg Hydro-Electric System is preparing to develop Slave Falls on the Winnipeg River, and tenders are already being called for some of the equipment likely to be required. Work cannot, however, be commenced until the project is approved by the ratepayers at the civic elections in November. The Winnipeg Electric Company, Ltd., has made application to the Dominion and Provincial Governments for permission to develop Seven Sisters Falls, also on the Winnipeg River, but even with this development there may be a shortage of power in the near future unless further development is begun almost immediately. In Saskatchewan a Power Commission, recently appointed by the Government, has recommended the purchase by the province of the power plants of Regina, Moose Jaw and Saskatoon, to form the nucleus of a system ultimately destined to be province-wide. It is proposed that these cities shall, in due course, be linked together by transmission lines, and that from the pool thus formed power shall be distributed to the districts tributary to each point. In due course Prince Albert and North Battleford are to be connected with Saskatoon, and later on additional plants are to be established at various strategic points in the province. If the recommendations of the Commission are approved, the first step will be to erect a new plant in Saskatoon.

NEW BRUNSWICK.—The *Financial Times* reports that a message has been received from St. John, New Brunswick, giving the results of the operations of the New Brunswick Electric Power Commission up to last July. The Musquash development operation showed a deficit of $17,955, against $33,579 for the previous year, representing a gain of $15,624. For the future purchase of auxiliary power the sum of $32,625 has been provided, against $12,750 in the previous year, an increase of $19,875 directly charged to operation. Thus the gross improvement this year over last amounts to $35,499. The balance of reserve account for the future purchase of auxiliary power now amounts to $74,787.

Colchester.—PURCHASE OF UNDERTAKING.—The City Council has decided to purchase from the Urban Council the Wivenhoe electricity undertaking for £2,150.

Continental.—SPAIN.—The Agricultural Loans Committee has lately been considering over two hundred applications for loans sent in by agricultural syndicates or co-operative societies for the establishment of hydro-electric plants. Credits aggregating a very large sum have already been allotted, grain crops being in some cases assigned as guarantees.

Halifax.—ELECTRICITY EXTENSIONS.—The Corporation on September 5th approved a recommendation of the Electricity Committee to carry out extensions to the electricity works at a cost of £159,000.

Hastings.—INQUIRY.—A Ministry of Transport inquiry was held recently relative to the application of the Corporation to erect overhead lines in a considerable area in East Sussex for the supply of electricity. The Deputy Town Clerk said that the estimated cost of the whole scheme was £70,000, and with regard to opposition on the grounds of amenity he stated that the Corporation appreciated as fully as the East Sussex County Council and the Battle Rural District Council that Sedlescombe was one of the prettiest spots in the district, but the effect of erecting the poles would not be so objectionable as suggested. Until the cost of the work had been met, the tariff would be 3d. per kWh above that at Hastings, which was 8d. per kWh for lighting, and 1½d. per kWh for heating, cooking and power.

Helston.—ELECTRICITY SUPPLY.—The manager of the Cornwall Electric Power Co. has informed the Town Council that it is intended to supply electricity to the town by means of overhead cables from Porkellis Mine, Wendron, and it is hoped that a supply will be provided before Christmas.

Horsham.—EXTENSION OF SUPPLY AREA.—The Urban District Council has decided to apply for a Special Order to supply electricity to an extended area, which will include Warnham, Kingsfold, Southwater, Christ's Hospital, Broad Bridge Heath, and parts of Faygate and Rowhook. The estimated cost is £7,100, but £1,250 of this is chargeable to the existing undertaking. It is estimated that in less than five years the added area will show a substantial profit.

Irish Free State.—DUBLIN.—The Corporation electricity works is to supply electricity to some 32 towns and townships in the Leinster area of the Irish Free State from and after October 1st. This will be done by overhead network erected throughout the province in connection with the Shannon scheme. The linking-up with the Dublin Electricity Department is only a temporary arrangement until such time as the Shannon scheme is completed. The Electricity Supply Board is now considering the question of charges, and it is stated that probably a fixed minimum charge per week for electricity, based on the valuation of the customers' houses, will be put into operation. The fixed charge will include the repayment of the cost of wiring customers' houses. Over and above such a minimum charge, a charge of 2d. per kWh will be charged to users for electricity supplied. At this rate it is calculated that occupiers of five-roomed houses in the rural towns, where the ratable values are low, will pay about 2s. 6d. per week for the lighting of their houses, and a supply of power sufficient to work a vacuum cleaner and an electric iron. This sum will also cover the cost of wiring. The Supply Board intends to give the arrangement a trial for one year, and if it proves satisfactory, then rates on a corresponding basis will be finally fixed for the full Shannon scheme when it comes into operation next year.

Leeds.—LOANS.—The Corporation Electricity Committee is applying for sanction to the borrowing of £110,000 for services, and £35,000 for the assisted wiring scheme.

Leek.—ELECTRICITY AGREEMENT.—The Urban District Council has approved an amended draft agreement with the Stoke-on-Trent Corporation for a bulk supply of electricity to the Council.

Lincolnshire.—INQUIRY.—The Electricity Commissioners are to hold an inquiry at Lincoln in October into various schemes for the electrification of Lincolnshire.

Liverpool.—CENTRAL BOARD'S SCHEME OPPOSED.—The Liverpool Chamber of Commerce has endorsed the objections of the Corporation to the Central Electricity Board's proposals for the supply of electricity under the North-West England and North Wales scheme. It was pointed out that the Corporation objected to importing from outside stations, as far distant as twenty-six miles, between 60 and 70 per cent. of its electricity requirements. It objected more especially because, having been approached by the Electricity Commission to construct a super-station on the Mersey, it had arranged to do so at Clarence Dock, on the distinct understanding that it and Lister Drive station would supply the requirements of Liverpool.

PUBLIC LIGHTING.—The report of the city lighting engineer (Mr. P. J. Robinson) covering the year ending March 31st last shows that the mileage of street electric lighting increased during the year from 108 to 151, and the number of electric lamps lighted from 6,325 to 8,555. The gross expenditure of the City Lighting Department amounted to £123,810, and a revenue of £17,546 was received from work performed for and material supplied to other departments and bodies, making the net capital expenditure on public lighting £106,264.

LOAN SANCTIONED.—The Corporation has received sanction to a loan of £15,000 for h.p. switchgear and rotary convertors.

SUGGESTED DIVISION OF ADMINISTRATION.—The following notice of motion has been submitted to the Council:—"That, in view of the individual importance of both tramway and electrical matters, the Committee of Selection, when appointed, be requested to consider the desirability of recommending the Council to appoint separate and distinct standing committees for the management of each of these undertakings."

Llandudno.—AUTUMN ILLUMINATIONS.—The Manchester *Daily Dispatch* reports that the Town Council is contemplating a scheme of autumn illuminations, which, if approved at the next meeting of the Council, will include the placing of festoons of fairy lamps along the whole length of the promenade, massed lamps amongst the trees at the entrance to the pier, and the illumination of the Happy Valley and the outline of the Great Orme if an expert in the arrangement of artistic lighting declares this part of the scheme to be practicable.

London.—BERMONDSEY.—The Borough Council Electricity Committee has received a letter from the Electricity Commissioners, stating they will be prepared to approve of the Borough Council and the London Electric Supply Corporation, Ltd., entering into a supplemental agreement with regard to bulk supply.

Maentwrog.—INAUGURATION OF HYDRO-ELECTRIC SCHEME.—The *Liverpool Post* reports that the Minister of Transport, Col. Wilfrid Ashley, will visit Maentwrog on October 15th, to inaugurate the latest units in the North Wales Power Company's hydro-electric scheme. The five dams erected above the Maentwrog Valley now hold a sheet of water two miles long and a mile wide. One of these dams is 400 ft. long and 100 ft. deep, and from its base runs a large-dimension pipe-line conveying the water to the roadside power station. Over 100 feet below Maentwrog is the third unit, and eventually all three will be linked up and interconnected with the Merseyside power stations.

Malvern.—PRICE REDUCTIONS.—The Urban Council has made reductions in the charges for electricity, resulting in the following rates:—Lighting: From 6½d. to 4d. per unit, according to the consumption. Power, heating, and cooking: From 2d. to 1½d. per unit, according to consumption.

Manchester.—LOANS SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the borrowing of £26,500 for h.p. transmission mains, and £50,000 for services.

Paisley.—PRICE REDUCTIONS.—The Corporation Electricity Department has reduced the charges for electricity to 5½d. per kWh for lighting, and to ¾d. per kWh for heating and all domestic purposes.

Peterborough.—YEAR'S WORKING.—The accounts of the city electricity undertaking (engineer, Mr. H. A. Nevill) for the year ended March 31st last show a total revenue of £112,401, as compared with £105,046 in the preceding year. Working expenses amounted to £67,865, as against £71,903, leaving a gross profit of £44,536 (£33,143), to which was added an unemployment grant of £1,478, making a total of £46,014 available. After providing for capital and other charges there was a net deficit of £2,077, as compared with a loss of £1,738 in 1926-27. The capital expenditure during the year amounted to £148,499, and included £95,786 for machinery, plant, &c., and £26,784 for mains and services. The sales of electrical energy increased from 15,315,079 to 19,348,751 kWh, and the maximum supply demanded from 5,440 to 6,500 kW.

Retford.—LOAN.—The Town Council is applying for sanction to a loan of £16,250 for new plant and the connecting up of four routes in rural areas.

Reunion.—HYDRO-ELECTRIC SCHEME.—It is reported that plans have been prepared for the establishment of an electricity distribution system on the Island of Reunion, in the Indian Ocean. The project includes the establishment of a hydro-electric plant to utilise certain water falls from which it is estimated 25,000 kW could be obtained in dry weather and 40,000 kW in full water periods.

South Africa.—SWELLENDAM, CAPE PROVINCE.—The electricity supply undertaking was recently officially opened by Mr. C. E. Viljoen, Deputy Administrator. The capacity of the plant is 136 kW. The cost of the scheme was about £13,000.

Special Orders.—The Carmarthen Electric Supply Co., Ltd., has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity in part of the rural district of Carmarthen.

The Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them to be granted to the Power Development Co., Ltd., for the supply of electricity by the West Hampshire Electricity Supply Co., Ltd., in the rural district of Hursley.

Stretford.—E.H.P. TRANSMISSION LINES.—The Urban District Council Electricity Committee is seeking consent to establish two e.h.p. transmission lines between Barton power station and the Stretford undertaking at a cost of £30,000, to meet the requirements of the scheme of the Central Electricity Board.

PRICE REDUCTION.—The Committee has decided that the War advance of 30 per cent. in respect of supplies of electricity for power purposes shall be reduced to 20 per cent. as from the meter readings for the period ending September 30th.

Swansea.—NEW POWER STATION SITE.—*The Times Trade and Engineering Supplement* states that the question of a site for the new Swansea "super-power" station is still undecided. The proposal to reclaim a portion of the foreshore is not likely to be pursued, owing to considerations of cost and length of time required. The site most favoured now is one at Port Tennant, where trial bores have been made to ascertain the nature of the soil and foundations. This site would avoid the cooling water problem, as the water of the Queen's Dock would be available in accordance with a tentative agreement with the Great Western Railway Company. It is believed that the adoption of this site would expedite the transfer of the existing station and enable the North Dock, from which that station derives its cooling water, to be filled in. The new generating station is estimated to require an outlay of over £1,000,000.

ELECTRICITY EXTENSIONS.—The Corporation Electricity Committee has decided to carry out works involving an expenditure of £24,000, including the laying of mains to outlying districts. The Committee has also decided to supply the Brynamman Electric Supply Company with electricity direct at an initial cost to the Corporation of £4,400.

Worcester.—HIRE-PURCHASE SCHEME.—The electrical engineer has recommended the City Council to adopt a system of deferred payments for the hire and hire-purchase of wiring small houses, and to apply for loans totalling £8,000 for the purchase of cookers to be let out on hire and for assisted wiring installations.

Tramway and Railway Notes.

Argentina.—BUENOS AIRES.—The Municipality has given its decision on the project of underground tramway construction submitted by the Buenos Aires Lacroze Tramway Company. The Department of Public Works of the Municipality has laid down certain conditions with regard to levels, the location of stations, tariffs, speed and frequency of trains, &c. According to the *Review of the River Plate* the company has accepted the conditions stipulated, and the construction of the new subway will be started in the near future. The company's proposal was to have six stations between Federico Lacroze and the corner of Callao and Corrientes, including these two terminals. Although, by law, it is provided that the distance between stations shall not be less than 300 metres, no provision is made for maximum distances between stations. The Public Works Committee of the Municipality states, however, that in considering the Marco proposal it was laid down as a desirable proposition that the maximum distance between stations should be 550 metres in the busy sections and 880 metres in those sections of the route where traffic is bound to be least intense. Consequently, the Committee requires that the company shall provide three stations in addition to the six allowed for in the plans. It would appear that the basis of the stipulation regarding speed and frequency of trains is the existing underground service of the Anglo-Argentine Tramways Company. As for the arrangement of tariffs, it is provided that this question shall be thrashed out with the co-operation or "intervention" of the Municipality.

Australia.—SYDNEY.—The programme for the electrification of the Sydney suburban railway lines has been amended, and services will commence and will be in complete operation as follows: Sydney-Homebush, complete service, December 31st, 1928. Homebush-Parramatta, April, 1929; complete service, June, 1929. Strathfield-Hornsby, January, 1929; complete service, March, 1929. Granville-Liverpool, July, 1929; complete service, September, 1929. Regent's Park-Bankstown, October, 1929; complete service, October 31st, 1929. Lidcombe-Cabramatta, September, 1929; complete service, October, 1929.

Continental.—GERMANY.—Berlin, which has for some time past financially controlled the three large transport undertakings in the city, the tramways, elevated and underground railways and the omnibus company, is now centralising these concerns in one company under the title of the Berlin Traffic Company, with a share capital of 400,000,000 marks, or, roughly, £20,000,000.

Work has been completed on the electrification of the Potsdam-Erkner section of the Berlin City Railway and the line opened for traffic. The new section has a length of about 31½ miles, and, as compared with the old steam trains, a saving of 25 per cent. in time is being effected, enabling 40 electric trains per hour to be run over the section.

Japan.—RAPID TRANSIT RAILWAYS.—Applications for charters have been filed recently with the Government for rapid transit electric railways between Kiryu, Cumma Prefecture, and Otsuka, Tokio, covering a distance of 56 miles and between Nara and Wakayama Prefectures, a distance of 62 miles.

London.—PICCADILLY CIRCUS STATION.—*The Times* reports that considerable progress has been made with the work of constructing the new underground station in Piccadilly Circus. The water mains, electricity supply and telephone cables which crossed the Circus have been carried into a pipe subway round the edge of the Circus. This 12-ft. subway is nearly one-third of a mile long, and, in future, it will be possible to carry out all necessary repairs to the mains and cables without breaking up the surface of the road. The roadway itself is carried on 50 solid steel pillars, from which a network of girders radiates outwards all round the Circus. The tunnels leading to the Piccadilly and Bakerloo lines, and their passage-ways, are practically complete, and many of the escalators are nearing completion. It is estimated that passengers will be able to get from the street level to the trains five times as quickly as they can do at present. Experiments with schemes of subdued lighting will be made.

York.—DEPÔT EXTENSIONS.—The Corporation Tramways Committee has decided to carry out extensions and alterations at the Fulford Road car depôt, at an estimated cost of £5,000, excluding track and electrical equipment.

Telegraph and Telephone Notes.

Bouvet Island.—Wireless Station.—It is reported that a Norwegian wireless station is to be established on Bouvet Island, the cost of which is being defrayed by Consul Lars Christensen. According to *The Times*, the complete apparatus, including buildings and masts, has been ordered and M. Otto Rogne, for the last four years manager of the wireless station at Advent Bay, has been appointed manager of the station, with two assistants. With his assistants and the wireless outfit, he will leave Sandefjord on October 1st in the floating factory *Thorshammer*. Owing to the importance of Antarctic meteorological information, especially to the agriculture of South Africa, America, and Australia, the construction of a permanent wireless station on Bouvet Island is likely to attract general attention. Bouvet, which is a remote island in the Southern Ocean, has recently been claimed by both Great Britain and Norway; no announcement has been made of a settlement of the claims.

Ecuador.—Wireless Telegraphy.—A presidential decree has authorised the erection of a wireless station at the port of Limones and an initial appropriation of 11,760 sucres (1 sucre=2s.) has been passed for its construction. The first wireless station was erected at Guayaquil in 1913, and since then the Marconi Company has constructed a station at Santa Elena Point with a range of over 500 miles. There are radio-telegraph stations at Quito, Guayaquil Port and Esmeraldas, constructed by La Société Française Radio Electrique, of Paris, on the tuned-spark system. The stations at Quito and Guayaquil are of 10 kW with antennas of 100 metres, and that at Esmeraldas is at present 5 kW with an antenna of 50 metres; at both the umbrella type has been adopted. It is proposed to increase the wireless stations in Ecuador to 12, including one for inter-continental service.—*Reuter's Trade Service* (Quito).

International Telegraph Congress.—Code Words.—This week the International Telegraph Congress has been held in Brussels, delegates attending from sixty-five countries. One of the proposals under discussion was to reduce the number of letters allowed in code words from 10, as at present, to five; the rate, however, would only be reduced by 30 or 40 per cent., thus increasing the cost to business men. On the other hand, it was proposed that rates for ordinary telegrams should be reduced. For the first time users have had a voice in the discussion of these problems; the International Chamber of Commerce was asked to attend the Congress to represent world users of communications. After careful inquiry the Chamber decided to demand that if the number of letters in code words was reduced by half, the rate should also be reduced by half. The president of the International Chamber was represented by Sir John Sandeman Allen, M.P., as head of the Transport and Communications Group of the International Chamber. The delegation was headed by Mr. Robert E. Olds, former American Under-Secretary of State, the other members of the delegation being Mr. Ed. Dumoulin (Great Britain), Dr. Luschen (Germany), Mr. Odier (Switzerland), and Mr. Henri Story (Belgium).

London Telephone Service.—Breakdown Due to Fire.—As the result of a fire which took place in a subway under the Victoria Embankment on Saturday last, the London telephone service was seriously disorganised. Ten or twelve exchanges were severely affected, owing to the destruction of junction lines, communication between east and west by this route being cut off, and the commercial and stockbroking interests were put to great inconvenience. The fire, of which the origin is unknown, extended along the subway about 80 yards, and destroyed some 200 miles of telephone wires, including 85 junction groups and 1,400 private lines connected to the City and Central exchanges. The land lines of the Eastern Telegraph Co. were cut, and only two of the company's submarine cables were available, with the result that communication with many countries overseas was subjected to delay. The British Broadcasting Corporation's Sunday programme was upset, as the provincial centres taking the London service were cut off from 2LO. Every effort was made by the Post Office Engineering staff to restore the normal conditions, but several days elapsed before this was accomplished. The same subway contains electric power cables and gas mains, and there was considerable risk of explosion; the cables supplying electricity for lighting the south side of the Embankment were destroyed.

Pitcairn Island.—Radio Communication.—Pitcairn Island is probably the world's loneliest settlement, without any means of communication. Some of the enterprising islanders, as a means of breaking down their extreme isolation, began to learn the Morse code from books with the aid of Morse keys and buzzers given to them by the Marconi operators aboard the ships that called. In 1921 they obtained a simple crystal receiver and in 1926 they were given a Marconi Type-31 ship's crystal receiver. With an aerial 180 feet long supported in the middle by a single mast 70 feet high, they have obtained excellent results, and on one occasion they received messages over a distance of 400 miles from a ship. The success and utility of the results led the islanders to desire a means of sending messages to ships as well as receiving. In order to do this it was necessary for one of their number to qualify as a wireless operator in New Zealand, the nearest point of civilisation. After passing his examination he came to London, and at the Marconi works he was presented with a ship's spark transmitter of ½-kW power for the benefit of the islanders. The inhabitants of Pitcairn number about 200, and among the few "outsiders" living there is an American engineer who possesses a stationary petrol engine that will probably be used to provide the power for the transmitter.

Sweden.—Submarine Telephone Cables.—Telephone communication has recently been established between Sweden and Finland by the laying of submarine cables between Sweden and the Island of Aland in the Gulf of Bothnia and between the Island and Finland.

Switzerland.—League of Nations' Wireless Station.—The attitude of the Swiss Government to the League of Nations' proposal to equip a wireless station of its own at Geneva is causing dissatisfaction, says the *Wireless World*. The Government apparently does not object to the project, but demands complete control of the station, offering to permit the League exclusive use of it in time of war only.

The Telegraph Service.—American Methods.—A party of officials from the Post Office left England on September 8th for the United States to study the American telegraph service, its methods, and its organisation. In the United States the service is owned by private companies; there is no State system. One of the recommendations of the Hardman Lever Report on the British inland telegraph service was that studies should be made of Imperial and foreign methods. The party consists of Mr. L. Simon, assistant secretary, who is in charge of the inland telegraphs; Mr. J. Stuart Jones, controller of the Central Telegraph Office; Lieutenant-Colonel A. G. Lee, assistant engineer-in-chief; Mr. G. T. Archibald, inspector of telegraph traffic; and Mr. A. E. Stone, an assistant engineer.

Radio Notes.

British Broadcasting. — Broadcasting Pictures. — The B.B.C., in conjunction with the General Post Office, has concluded some preliminary technical experiments in the wireless transmission of still pictures. As a result, arrangements have been made for a short picture transmission daily from Daventry (5XX) outside regular programme hours. These transmissions will begin in October. The material of each transmission will consist of a selection from several subjects. If and when it is discovered that there is a sufficient public demand for still pictures radiated in this way, transmissions will be included in regular programme hours. The Fultograph system will be used for the series of transmissions beginning in October. The B.B.C. points out that methods of transmitting and receiving pictures such as the Fultograph should not be confused with what is commonly known as "television," which is in no way involved in this series of experiments, and of which no practical demonstration has yet been made to the B.B.C.

Italy.—New Stations.—When the Genoa and Turin stations are completed towards the end of this year, Italy will possess six broadcast transmitters. The newest installation was completed in 32 days, the Ente Italiano per le Audizioni Radiofoniche having decided upon its erection only a month prior to its inauguration on July 12th last. Situated between Merano and Bolzano in Italy's Alpine provinces (formerly Austrian), the station's aerial power is 200 watts and its wavelength 400 m. (750 kc.); the two-wire L-type antenna is suspended between two lattice steel masts 131 ft. high and 262 ft. apart. The copper-wire earth network is 2 ft. below the surface.

Licences.—Still Increasing.—Broadcast radio-telephone receiving licences current in Great Britain at the end of June, 1928, numbered 2,511,736, an increase of 5,477 during the month of June. The following interesting figures, issued by the Bureau Internationale de Radiophonie at Geneva, says the *Wireless World*, are an indication of the approximate number of licensed listeners in some of the countries of Europe: Austria, 293,408; Denmark, 214,734; Hungary, 98,011; Lithuania, 9,407; Norway, 64,722; Switzerland, 66,731; Sweden, 357,828; Czecho-Slovakia, 225,501.

The Union Internationale.—Recent Work.—The B.B.C. announces that the Council and the various committees of the International Union of Radiophony, which, at the invitation of the Reichs-Rundfunk Gesellschaft (German Broadcasting Company), met in Berlin on August 31st last, concluded their work on September 5th. The Council recognised that it was now advisable to attempt a revision of the friendly agreements for the allocation of wavelengths in Europe in order that European Governments, having in mind the ratification of the Washington Convention, might make the most efficient use of the wave-band reserved by this Convention to broadcasting. The Council took note of the work done by the Rome Conference in revising the Berne Convention (copyright). The Conference has permitted each Government to lay down in its own country a favourable formula for the exercise of this right in the case of broadcast works. The Council likewise followed the suggestions of the Rapprochement Committee for the establishment of uniform monthly statistics, with the object of gaining the greatest possible advantage for listeners from the artistic and educational efforts of the different countries.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—Posts and Telegraphs Department. October 30th. Loading coil pots.

October 23rd. Insulated wire. (B.X. 4674.)*

October 26th. City Council. Totally enclosed metal-clad switchgear. (B.X. 4698.)*

November 13th. Switchboard keys and parts.*

VICTORIAN ELECTRICITY COMMISSION.—December 17th. Supply of metal-clad switchgear and accessories. (Spec. 28/68, £1 1s. for three copies.)

SYDNEY.—October 10th. N.S.W. Railways and Tramways. 2,200-V ironclad switchgear for Sefton sub-station. (Spec. 2s. 6d., from the Chief Electrical Engineer.) November 14th. Supply and erection of ash-sluicing equipment for Lithgow power station. (Spec. 819, 5s., from the Chief Electrical Engineer.)

Bedwas and Machen.—September 24th. Urban District Council. Overhead and underground mains. (September 7th.)

Belgium.—BRUSSELS.—September 27th. Municipal Council. Supply and installation of a transformer plant at the central power station. Particulars from Hôtel de Ville.

Birkenhead.—September 21st. Mersey Railway Co. Stores, including electrical sundries and metallic-filament and carbon-filament lamps and fittings. Patterns and samples on view September 13th and 14th. Forms of tender, &c., from Mr. J. Shaw, general manager, Central Station.

Central Scotland.—September 18th. Central Electricity Board. Civil engineering work, including reinforced-concrete structures, foundations, road, and sites for sub-stations at Clyde's Mill, Dalmarnock, and Bonnybridge. Preliminary particulars from Messrs. Kennedy & Donkin, 276, St. Vincent Street, Glasgow, or Broadway Court, Westminster, S.W.1. Specification and form of tender from the Board, 1, Charing Cross, W.C.2.

Chard.—September 17th. Corporation. Motor and pump houses, electric motors and other works in connection with the water scheme. Details from the Engineer, Mr. S. R. Lowcock, 6, Queen Anne's Gate, Westminster, S.W.1, or from the Town Clerk.

Edinburgh.—October 15th. Corporation. Coal and ash plant for Fortobello power station. (September 7th.)

Midlothian and Peebles District Asylum, Rosslynlee. Electrical fittings for six months. Forms from Mr. Chilton L. Addison-Smith, 19, Heriot Row, Edinburgh.

Egypt.—GIZA.—October 4th. Royal School of Engineering. Small tools, accessories for machine tools, and electrical plant. (B.X. 4703.)*

Ministry of the Interior. November 10th. Supply and installation of a distribution network for the village of Kena. (B.X. 4707.)*

Exminster.—September 21st. Devon Mental Hospital. Supplies of electric lamps, &c., for six months. Tenders from the Clerk, Mr. Cecil Masters, Exminster.

Grimsby.—September 21st. Electricity Department. E.h.p. switchgear and alterations to existing switchgear. (See this issue.)

September 22nd. Electricity Department. One year's supply of paper-insulated lead-covered cable. (September 7th.)

India.—September 18th. India Store Department. 187 miles of cable. October 4th. 245 electric ceiling fans. (September 7th.)

September 20th. Seven oil-immersed, self-cooled, indoor type, step-down 65-kVA, 3,300/420-V transformers for Ahmednagar.

Leeds.—September 29th. Electricity Department. Supply and erection of 3-phase switchgear at Kirkstall power station. (August 31st.)

London.—H.M. OFFICE OF WORKS.—September 18th. Renewal of battery plates at the National Physical Laboratory, Teddington (August 31st.)

METROPOLITAN ASYLUMS BOARD.—October 3rd. Installation of automatic telephones at Princess Mary's Hospital. Installation of kinematograph at Darenth Training Colony. Wiring of outside supply at Colindale Hospital. (September 7th.)

SOUTHWARK.—October 23rd. Electricity Department. Electric cable for 12 months. (See this issue.)

New Zealand.—WELLINGTON.—November 27th. Public Works Department. Generators and water turbines, in connection with Section 1 of the Waitaki power scheme. (B.X. 4677.)*

Norwich.—October 8th. Electricity Department. 12,500-kW turbo-generator and condensing plant. (See this issue.)

Rossington.—September 18th. West Riding Education Committee. Electric lighting installation, Middle School. Particulars from Education Department, County Hall, Wakefield.

Rumania.—CONSTANTZA.—Port Authority. October 1st. One electric portal crane and two goods lifts. (A.X. 6797.)*

South Africa.—JOHANNESBURG.—September 27th. Town Council. Switchgear and rotary convertor.

Electricity Supply Commission. October 26th. Supply, delivery, and erection of equipment for a hydro-electric power station, Gordon's Bay hydro-electric scheme, and two outdoor sub-stations. Tenders may be submitted on any or all of the following sections:—(*a*) Waterwheels; (*b*) generators; (*c*) switchgear, relays, cables, &c.; (*d*) outdoor sub-station steel structure, switchgear and copper; (*e*) miscellaneous equipment, including precision instruments, small petrol-driven generator set, oil filter, &c.

September 27th. Bare copper wire.

October 4th. Electric cables and wires.

October 11th. Automatic telephone exchange for Cape Town.

November 9th. Posts and Telegraphs Department. Wall telephones for the Hillbrow exchange. (B.X. 4709.)*

CAROLINA.—October 1st. Municipality. Supply and erection of plant suitable for electric lighting for the town; electrically-driven pump.

SALISBURY (S. RHODESIA).—October 1st. Municipality. H.p. transmission line (10½ miles), four 250-kVA transformers, centrifugal pumps, motors, switchgear, and crane.
—*South African Engineer.*

Taunton.—September 27th. Electricity Department. One 2,000/3,000-kW turbo-generator with condensing plant, &c. (September 7th.)

Uruguay.—MONTEVIDEO.—State Electricity Supply Works. October 17th. Automatic voltage regulator. (B.X. 4699.)*

October 15th. Electricians' pliers and wire drawing machines. (B.X. 4702.)*

Warrington.—September 18th. Electricity and Tramways Committee. Twelve months' supply of earthenware conduits. (September 7th.)

Waterford.—Corporation. September 21st. Materials for and erection of consumer's overhead services. (August 31st.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—SYDNEY.—City Council.—The *Sun* (Sydney) of July 24th, just to hand, reported that the following tenders for 33,000-V cable in connection with the transmission of the supply from the Bunnerong Station had been received:—

Tenderer.	Formal tender.	First alternative.	Second alternative.
	£	£	£
Metropolitan-Vickers Electrical Co., Ltd.	213,717	212,769	230,991
British General Electric Co.	168,825	161,780	166,268
British Insulated Cables, Ltd.	195,151	174,718	—
Johnson & Phillips, Ltd. ...	180,085	—	—
Chas. McIntosh, Ltd. ...	188,232	—	—
Standard Telephones and Cables, Ltd.	146,369	149,159	—
Bloch & Gerber, Ltd. ...	182,228	165,184	—
Enfield Cable Works, Ltd....	203,157	195,138	—
Siemens (Aust.), Ltd. ...	139,041	147,392	154,500
W. T. Henley's Telegraph Works Co., Ltd.	203,713	202,073	198,713
Noyes Bros., Ltd.	185,616	176,851	—
Liverpool Electric Cable Co., Ltd. (Item 2 only) ...	24,240	—	—

Aspenden (Herts.).—Parochial Church Council. Accepted :—
Installing electric light at the Parish Church (£90); electric heating installation (£116).—North Metropolitan Electric Power Supply Co.

Birkenhead.—Electricity Committee. Accepted:—
Pole mounting transformers for Wirral.—Ferguson, Pailin, Ltd.
11,000-V branch overhead line from Thornton Hough to Rocklands with a 30-kVA transformer at schedule rates.—W. T. Henley's Telegraph Works Co., Ltd.
Low-pressure cable (£1,084).—Hackbridge Cable Co., Ltd.

Bolton.—Tramways Committee. Accepted:—
Electrically driven lathe and screwing machine.—Thomas Mitchell & Sons, Ltd.

Brewood.—Accepted:—
Installing electric light fittings at the Parish Church (£80).—Messrs. Truman.

Bristol.—Health Committee. Accepted:—
14 poles for lighting streets at Ham Green Hospital (£131).—Colston Electrical Co., Ltd.

Burton-on-Trent.—Electricity Committee. Accepted:—
Supply and laying cables to works of Pirelli, Ltd., in Derby Road (£6,566).—Pirelli-General, Ltd.
Switchgear for Pirelli's works (£582).—General Electric Co., Ltd.
De-gassing and evaporating plant at electricity works (£2,750).—W. & J. Weir, Ltd.
Switchgear in connection with electricity supply to Granville Colliery.—Johnson & Phillips, Ltd.

Deal.—General Post Office. Accepted :—
Electric lighting installation at the new telephone exchange.—E. A. Pinto (Ramsgate).

Glasgow.—Hospitals Committee. Recommended :—
Electric lighting, telephone and fire alarm installation at Knightswood Hospital (£340).—P. H. Cossar.

Halifax.—Town Council. Accepted:—
Installing electric light in 94 houses.—E. Mitchell.

Leeds.—Electricity Committee. Accepted:—
Cables.—Macintosh Cable Co., Ltd. (£1,810); Greenwich Cable Works, Ltd. (£2,550).
Circulating water pumps at Kirkstall power station (£5,044).—W. H. Allen, Sons & Co., Ltd.
Tramways Committee. Accepted :—
Two miles of trolley wire.—F. Smith & Co.

Liverpool.—Tramways & Electric Power & Lighting Committee. Recommended :—
Two 9-in. and one 3-in. electrically-driven centrifugal pumps (£918).—Drysdale & Co., Ltd.
70 40-h.p. D.K. 30/2H. tramcar motors (£190 per motor), including roller bearings.—English Electric Co., Ltd.
MERSEY DOCKS & HARBOUR BOARD.—Works Committee. Accepted :—
Cables.—Liverpool Electric Cable Co., Ltd.

London. — BERMONDSEY. — Electricity Committee. Accepted :—
E.h.p. switchgear and control panel for additional rotary convertor (£1,245).—A. Reyrolle & Co., Ltd.
Control and emergency lighting battery (£223).—Hart Accumulator Co., Ltd.
Switchboard for control and emergency lighting battery (£34).—Crompton Parkinson, Ltd.
Laying e.h.p. cables and boxes for l.p. cables (£1 5s. 6d. each).—Siemens Bros. & Co., Ltd.

Maidstone.—Town Council. Accepted :—
Switchboard panel (£76).—British Thomson-Houston Co., Ltd.

Manchester.—Art Gallery Committee. Accepted:—
Installation of electric lighting at Horsfall Museum and Branch Art Gallery.—Albert E. Sudlow & Co.
Education Committee. Accepted :—
Electric lighting at Claremont Road municipal school, and electric lighting alterations New Islington school clinic.—Sudlow & Co.
Electric lighting alterations Bangor Street school.—Seddon and Sons.

Scunthorpe and Frodingham.—Urban District Council. Accepted :—
3,400 yards of cable.—Standard Telephones & Cables, Ltd.
Isolating links for cable (£52).—Metropolitan-Vickers Electrical Co., Ltd.

Sheffield.—Markets Committee. Accepted:—
Main l.p. switchboard at abattoir (£664).—Park Royal Engineering Co., Ltd.
Watch Committee. Accepted :—
Supply of lamp pillars for 12 months (£1 15s. each).—Moorwoods, Ltd.

Spenborough.—Urban District Council. Accepted :—
Rewiring the town hall.—F. W. Birkett & Sons, Ltd.

Stockport.—Town Council. Accepted:—
Cable for the new purifier house at the gasworks (£129).—W. T. Glover & Co., Ltd.

York.—Electricity Committee. Accepted :—
Erection of sub-station in Poppleton Road (£256).—Walter West, Ltd.
Watch Committee. Recommended :—
Automatic traffic signals at Museum Street and Queen Street (£296).—Barber & Colman, Ltd.

Forthcoming Events.

Institute of Marine Engineers.—Friday, September 14th. Exhibition Lecture Hall, Olympia. 6.30 p.m. "A Note discussing the importance of Electricity in the modern ship, with special reference to the potentialities for Marine Propulsion." By A. C. Hardy, B.Sc.
Tuesday, September 18th. 6.30 p.m. At the Institute. Presidential address by Sir Alan G. Anderson, K.B.E.

"Model Engineer" Exhibition.—September 15th-22nd. Royal Horticultural Hall, Westminster, S.W.

National Radio Exhibition. — September 22nd-29th. Olympia, W.

World Power Conference.—September 24th-October 6th. Imperial Institute, S.W.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

BURMAN horse clipper.
Vulcaniser for use on a 550-V, 50-cycle circuit.
Small rubber and brass clips used for running flexible in a works, Patents Nos. 16,833 and 30,002.

Notes.

The Institute of Marine Engineers.

Amongst the awards offered by the Institute are the following, which are available to non-members this session :—The Institute Silver Medal for the best paper read by a non-member during the session; and the Herbert Akroyd Stuart award, value approximately £56, open to members of all grades and non-members, for the best paper on "The Origin and Development of Heavy Oil Engines," read at the Institute before April 30th, 1930.

There are also three Lloyd's Register Scholarships for apprentices and junior engineers, one being available each year for three years at £100 per year; application should be made by intending candidates not later than March 7th, 1929, in order that arrangements may be made for the examination in May of that year.

The World's Largest Electric Lamp.

The National Electric Light Association says that what is claimed to be the world's largest electric lamp, a 50,000-W experimental bulb, was built recently in the United States. It is like a radio tube in appearance; at the top of the bulb a radiator, made of metal fins, carries off the intense heat generated by the white-hot tungsten filament, which has a temperature of 5,500 deg. F.—twice as hot as molten steel. The bulb is filled with nitrogen gas, whose circulation cools it and carries upward into the radiator evaporated or thrown-off tungsten particles from the filament, thus preventing blackening of the walls. Although the present lamp is intended simply for a test by its designer, such huge lights ultimately may find use in airport lighting and for the illumination of motion picture studios.

Television in Germany.

It is reported in the daily Press that the German Post Office has bought up the entire German rights of the new television apparatus of the Hungarian inventor Denes De Mihaly, with the intention of giving a television service to holders of radio receiving licences. If the report proves to be correct it will be the first instance of a European Government officially adopting television as an adjunct to radio-telephony.

The Electrical Trades Benevolent Institution.

The handbook containing the report of the Council and the accounts for the year 1927, reports of the annual general meeting, 1927, and the annual festival held on February 8th, 1928, and other information, was issued last week.

The total income for the year was £4,714, and a sum of £2,235 was carried to capital account after the payment of grants and expenses, bringing the total of invested funds up to £32,513. The number of grants made during the year was 221, absorbing £2,049, as compared with 75 and £1,105 in 1926, and 81 and £934 in 1925. Mr. J. W. Beauchamp's appeal at the festival brought in £2,814.

The Council draws attention to the advantages of membership; the new class of subscriber (Associate) secures the benefits of membership for the small subscription of 5s. per annum. The office of the whole-time secretary, Capt. J. T. Keeping, whose salary is provided for three years from sources outside the funds of the Institution, is at 9, Southampton Street, W.C.1.

English Shop Practice.

In the *American Machinist* of September 1st, Mr. K. H. Condit recounts some of his observations during a short visit to a few of the best plants in the Midlands, which, with one exception, were enjoying an unusual amount of business. Without exception he was received with the greatest courtesy by the executives. He says: "Inside the English shops the visitor familiar with the latest American practice is struck at once by the number of belts in use. Motor-driven machines are almost non-existent, except for certain specialised American tools. English machine-tool builders, apparently, have given but little attention to built-in motor drives. I was told, however, that they are beginning to do so now. The millwright in an English shop is consequently an important personage. I saw well-arranged group drives and, in one shop, a complete installation of hangers fitted with anti-friction bearings. It is only fair to remark that the delay in adopting the motor drive is partly due to the variation in voltage and cycles. In one important manufacturing district, for example, every motor used is special. Under such conditions managers don't run wild in ordering machines with individual drives.

"Single-purpose machines are apparently less numerous than in American shops, a condition that may be explained by the small size of the lots going through. In the one shop visited where really large quantities of small parts were in process, plenty of machinery designed and built in the plant was in use and more was under construction.

"There is a great need in England for economic education, on depreciation and unit costs at least, just as there is in the United States. Much ancient machinery would be melted up if owners could be convinced as to just what it is costing them.

"Punch presses are guarded by sliding or pivoted gates, but belts are left much freer than would be permitted by an American insurance factory inspector. Perhaps after one look at the forest of belts in the average shop the safety legislators gave it up in discouragement, or concluded that there would be more protective than productive equipment if everything were fully guarded.

"Most of the material handling seems to consist of loading one or more pieces on a four-wheeled truck and pushing them to their destination. There are chain conveyors and roller conveyors in use in the most advanced works, but intermachine transportation has seemingly been given but little attention. A few electric trucks were in evidence, and one plant I visited was well equipped with standard containers and platforms for use with hand-lift or electric trucks. Jib and wall cranes are more generally used than is the case in America, monorails and travelling cranes not so much.

"These observations, since they were made in a few of the best English shops, probably picture practice considerably above the average."

Appointments Vacant.

Power station superintendent at Kalyan power station for the Great Indian Peninsula Railway. Electricians for East Dereham Urban District Council. Cable jointer (£400) for the Government of Nigeria. Assistant wireless engineer (£460) for the Government of Hongkong. Assistant electrical engineer (400 dollars per month+; dollar equals 2s. 4d.). Charge engineer (400 dollars per month+) for the Electrical Department of the Federated Malay States Government. Draughtsmen (various) for Graham Amplion, Ltd. Power station superintendent for the Plymouth Corporation Electricity Department. (See our advertisement pages to-day.)

Electric Steam Generation.

Interesting experiments for the purpose of generating steam by means of electricity at high pressure (50,000 to 80,000 volts) that may open the possibility of utilising the surplus energy of waterfalls to good advantage, are being carried on under the auspices of the Swedish Institute of Industrial and Engineering Research, according to a report just published in *Swedish Export*, the organ of the General Export Association of Sweden. It is reported that the trials so far carried out have yielded most interesting results. The electric boilers now in use cannot use a higher pressure than 30,000 volts, but if the costly transformation from the customary transmission-line voltage can be avoided, this mode of generating steam will prove remarkably cheap. Pulp mills, which are very large consumers of steam, would in many cases benefit by the proposed arrangement.

Municipal Tramways and Transport Association.

The annual conference of the Municipal Tramways and Transport Association was held at Manchester this week, commencing on Tuesday with an informal reception at the Art Gallery by Ald. James Bowes, president of the Association and chairman of the Manchester Corporation Tramways Committee. On Wednesday, the Lord Mayor, Councillor W. Davy, welcomed the members in the Council Chamber of the Town Hall, and Ald. Bowes delivered his presidential address, after which the annual general meeting was held. In the afternoon Mr. H. P. Stokes (Plymouth) was to read a paper, and in the evening the annual dinner was to take place. Yesterday, a paper was to be read by Ald. J. K. Cheetham (Oldham), and to-day the Ship Canal is to be visited. Over 80 local authorities are represented at the conference, the delegates numbering 218.

Corrosion of Condenser Tubes.

One of the papers recently presented at the Conference of the Institute of Metals is the eighth report to the Corrosion Research Committee of the Institute, by R. May, A.R.S.M., investigator to the Committee. The report deals with some further investigations of "impingement attack" which were undertaken in order to interpret the results of certain tests on condenser tubes, and, in particular, to explain the relationship which appeared to exist between the effects of intermittent cavitation in the water, the behaviour of protective films under various conditions of impingement, and the effects of air-bubble impingement. A method of studying by measurements of the "film potential" is described in detail. The method is particularly useful for comparing the healing powers of the natural protective films on different condenser tube alloys, and should be of assistance in the development of specially resistant condenser tubes. Some experimental work is described which shows that, when there is no intermittent cavitation, "impingement attack" can still take place as a result of air-bubble impingement. This leads to the conclusion that there are two separate main causes of "impingement attack." In addition, the work shows that the size of the air-bubbles entangled in the water is a more important controlling factor than was formerly surmised. Very small bubbles seem to be comparatively harmless, even under conditions of strong impingement. The investigation has been greatly assisted by the use of the jet-test apparatus, and this has developed into a form which is very convenient for preliminary tests on condenser tubes. In a discussion of the more important factors controlling "impingement attack" in condensers, the view is taken that there are two main causes—namely, intermittent cavitation as shown by Sir Charles Parsons, and air-bubble "impingement" as shown by Dr. Bengough R. Pirret, and the author. In either case the mechanism of the action has points of great similarity, and both are known to depend to an important extent on the occurrence of rotating motions of the water.

Electric Power in Austria.

The Austrian Parliament has passed a Bill freeing from all taxes for a period of ten to twenty years establishments producing and distributing electricity, the exact period, which will not be less than ten years, to be fixed by the Government in each case. The works to receive this privilege will be those with a minimum capacity of 5,000 h.p. whose construction has been begun between January 1st, 1927, and December 31st, 1931, on condition that they use material and equipment entirely of Austrian origin (except when the home industry does not produce the goods required or asks excessive prices) and deliver to other parties at least 55 per cent. of the energy they produce. In this way the Government hopes to stimulate activity in the industries which specialise in the supply of electrical equipment and to help the circulation of electrical energy in the country.

Entirely dependent on foreign countries for her supplies of coal, Austria is very keen on making use of the considerable amount of water-power with which nature has supplied her. For a population of 6,500,000, these reserves, according to the latest estimates, amount to 3,400,000 h.p. (about half the resources of France, which has six times as many inhabitants). At present Austrian water-power is still very little exploited, and hardly 500,000 h.p. is developed. From 1919 to 1927 only 179,000 h.p. was added, and at the end of 1927 plant of 95,000 h.p. was being installed. The monetary turmoil and the economic difficulties which weighed on Austria after the war, the exorbitant cost of building hydro-electric works, the capital crisis, the dearness of money, and, finally, the increase in taxes, are the causes of this situation.

A series of financial measures will be put into force to complete the effectiveness of the new law. For instance, the enterprises are to be authorised to make extremely low amortisations for five years: the rate for hydro-electric stations has been fixed at 1¼ per cent.; for thermo-electric stations at 3 per cent.; and for transport and distribution lines at 2 per cent. Small hydro-electric stations with a minimum power of 1,500 h.p. and thermo-electric stations with a minimum power of 1,000 h.p. can even obtain exemption under certain conditions.—*Reuter* (Vienna).

Institute of Transport.

The telephone number of the Institute has been changed to Temple Bar 6030.

Miners' Safety Lamps.

The Secretary for Mines announces that on August 21st, 1928, he made an Order, under Section 33 of the Coal Mines Act, 1911, approving for use in all mines to which the Act applies, subject to the conditions specified in the schedule to the Order, the following types, amongst others, of safety lamps: *Electric lamps for general use*—Eatteries "Nife," "Federation" 4-volt, "Maurice" cap, "Federation" 4-volt cap, "Oldham" 6-volt pillarless, Wolf cap, No. 830 C. *Electric lamps for officials, or for special purposes*—"Pearson Ni+Fe" bull's-eye, "Ceag" 4-volt bull's-eye, "Ceag" inspection, "Federation" rescue No. 2 (for auxiliary purposes only), "Federation" 4-volt rescue bulls-eye type, "Gray-Sussmann" torch, "Oldham" officials' torch types "OH" and "OT" (for auxiliary purposes only), "Premier" pocket torch (for auxiliary purposes only), "Wootton." The Order also amends the schedules to previous Safety Lamps Orders by substituting revised specifications, or amending the specifications, of certain types of safety lamps already approved.

The Berlin Radio Exhibition.

All Germany had an opportunity of listening by means of relays by its 25 broadcasting stations, to the speeches made at the fifth German Broadcasting Exhibition, which was opened on August 31st in the Berlin Exhibition Buildings at Witzleben. The speakers were followed by the production of a speaking film, and a conducted walk through the exhibition. The tone film, which was produced by the Tri-Ergon Tonfilm Company, in conjunction with the Reichsrundfunkgesellschaft, depicted a tour of the German towns in which broadcasting stations are situated; the life of the cities and the work of the broadcasters were presented simultaneously in sound and in pictures.

According to *The Times*, it was noticed that the sound waves seemed to take more time to reach the ear than the pictures to reach the eye. The impression gained by many of the broadcasting experts present in Berlin for the conference of the International Broadcasting Union was that the film was technically not superior to other tone films, but was artistically of a very high standard. At a dinner in the evening, on the occasion of the International Broadcasting Conference, Dr. Bredow, the German broadcasting commissioner, delivered an address of welcome to the delegates. In his reply Vice-Admiral Carpendale (Great Britain), president of the Union Internationale de Radiophonie, mentioned the valuable assistance rendered in the Geneva Union by the vice-president, Herr Giesecke, and, on the technical side, by Dr. Harbich.

The principal features of the exhibition, apart from sidelines, such as the official speaking film, which is being shown daily, and a demonstration of the Mihaly system of television, and another of a method of synchronising ordinary cinematograph films and broadcasting transmissions, are noticeable progress in the supersession of crystal detector and head telephones, and in devices for deriving current from electrical mains. Prices, it is claimed, are, in general, lower than they were last year.

Electrical Pumping for Waterworks Operation.

When, forty to sixty years ago, largely encouraged by the enterprise of British engineers, the supply of pure water to big cities at home and abroad was taken in hand, the motive power for pumping was practically always the steam engine. The plant connected with many water supplies has done yeoman service, but now that the cost of labour has increased the time has come for the reorganisation of the machinery of many undertakings.

The Seville water supply is in the hands of an English company which has gone through difficult times, but its affairs are now on the up grade, and not the least of the influences favouring its rise has been the use of electricity for pumping. The water supplied by the company comes from several springs and wells on the high land above the city; the pumping was done till recently by several steam pumping stations, necessitating the carting of coal by road and the operation of comparatively small engines, an expensive arrangement nowadays. The following extract from the report of Mr. W. P. West, A.M.I.Mech.E., the engineer and manager, speaks for itself:—

"In order to attain the highest possible economy consistent with local working conditions, important reforms in the whole pumping system have been introduced during the year under review, and by the satisfactory results obtained therefrom up to the present, the soundness of this policy is clearly and practically demonstrated. Electricity is now employed as motive power throughout the entire works, and the original machinery has been completely replaced by one uniform system of modern-type electrically driven centrifugal pumping units. At the Adufe main pumping station, the old steam-driven machinery was closed down finally on December 21st last, since when the new plant has been in continuous operation with highly satisfactory results. The pumping station at Clavinque has been completely remodelled, and now consists of a pump chamber, sunk to a depth 24 feet below ground level, containing two duplicate electrically driven sets. Electric current is supplied to this station under the same conditions as those pertaining to Adufe.

"It is both interesting and satisfactory to note that, notwithstanding the fact of having delivered 440,000 cubic metres more water, the total pumping cost shows a very substantial decrease, and an equally appreciable one with regard to maintenance charges. The reduction in pumping charges is of still greater satisfaction when it is borne in mind that the economical effects following the reforms introduced at Adufe have only been felt during the last quarter of the year under review.

"Moreover, by the introduction of this uniform system, the running and maintenance of these stations has been extremely simplified, with the consequent elimination of all surplus labour. In addition to this, the electric measuring instruments at one end of the plant, and the Lea recording machines, for gauging the volume of the water pumped, at the other, give us every facility for establishing accurate records, and, at the same time observing and checking immediately any falling-off in the overall efficiency of the installations."

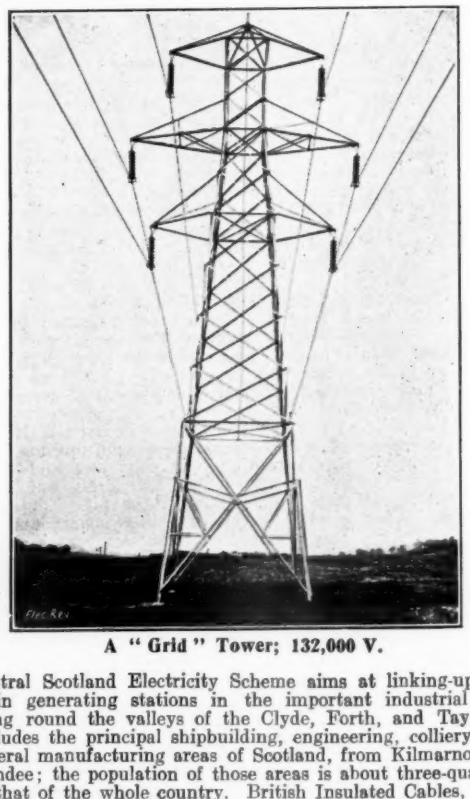
The economy realised in the year ending March 31st, although an important section only started electrical operation at the end of December last, assuming the peseta had stood during the 1927 financial year at the present rate of 28.44, for pumping and maintenance charges, was £3,763 out of £17,710 last year's equivalent when only part was electrically pumped, with 440,000 cubic metres more water pumped; assuming all goes well the saving in the present year should be very much more. As compared with two years ago, before any electrical pumping plant was in operation, the figures are better still. The power is supplied through overhead lines.

The alterations were made and the electrical plant installed under the direction of Mr. F. S. Cantney, M.Inst.C.E., Westminster.

The above remarks sum up the advantages which could be equally obtainable at many pumping stations, not only abroad, but also at home, and not merely for water supply, but also for sewage, and it is of interest that the London County Council is now looking into the question of electrical pumps for the down-river sewage stations.

"Grid" Towers in Scotland.

Progress is being made with the transmission lines of the Central Electricity Board in Scotland, for the purpose of the co-ordination of electric power supply on a national basis. The



A "Grid" Tower; 132,000 V.

Central Scotland Electricity Scheme aims at linking-up the main generating stations in the important industrial area lying round the valleys of the Clyde, Forth, and Tay, and includes the principal shipbuilding, engineering, colliery, and general manufacturing areas of Scotland, from Kilmarnock to Dundee; the population of those areas is about three-quarters of that of the whole country. British Insulated Cables, Ltd., was given the contract, and it was able to start the work immediately, owing to the fact that it was already carrying out a scheme on somewhat similar lines in the Far East. The accompanying illustration shows one of the steel towers carrying two 132,000-volt three-phase lines. We understand that the Central Electricity Board is to-day to entertain at Edinburgh all the station engineers whose stations are affected by its operations, and will take them on a tour of inspection.

No fewer than 1,550 towers will be required in Glasgow and the West of Scotland. The towers will be at least 60 ft. high, and some as much as 200 ft. They will have concrete foundations 30 ft. wide, and will be built of steel on the trellis principle; they are of square form, and taper to about eight feet at the top.

Civil Service Commission.

An examination is to be held for male assistant superintendent of traffic, Class II, in the London Telephone Service, and for male assistant traffic superintendent in the provinces. The regulations, particulars, and form of application can be obtained from the Secretary, Civil Service Commission, Bur-

lington Gardens, W. The latest date for receipt of application forms is October 25th.

Fatality.

An inquest was held on September 6th, on the body of Thomas Arthur Clark, an employé of the General Electric Co., Ltd., who was killed while working in a sub-station of the Ilford electricity undertaking. It appears that deceased entered a "live" chamber in order to inspect some connections, and received a shock at 6,600 V. A verdict of "Accidental Death" was returned.

Educational.

THE POLYTECHNIC, LONDON.—The prospectus of the Wireless and High-frequency Engineering courses for the 1928-29 session (enrolment: September 17th to 21st) indicates that these courses extend over a period of five years and provide for thorough training in the principles and technique of the subject. The fee for the full course is 30s. per session.

BATTERSEA POLYTECHNIC.—Full time day courses and evening courses, in electrical, mechanical, automobile, and civil engineering. (See our advertisement pages to-day.)

The Institute of Fuel.

The next meeting of the above Institute will be held at the Chemical Society's Rooms, Burlington House, Piccadilly, at 6 p.m. on October 10th, when Mr. T. A. Peebles will read a paper on "Automatic Combustion Control of Liquid, Solid and Gaseous Fuels." The annual conference of the Institute will be held at the Institution of Electrical Engineers, Savoy Place, W.C.2, on Wednesday and Thursday, November 21st and 22nd. The whole of the second day will be devoted to a symposium on "Fuel Control in Industry."

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. ARNOLD P. HILL, formerly an engineer with the British Broadcasting Co., and now with the British Thomson-Houston Co., Ltd., who was married on September 1st to Miss K. M. Johnson, has been presented with a case of cutlery by the Fitting Department at the B.T.-H. works; the bride received a dinner service from the company's Export Department.

The Guildford Town Council has appointed Mr. H. R. BILLING, of Pontypridd, as installation superintendent for the electricity undertaking.

The staff of the Rotherham Corporation Electricity Department have presented a cabinet of stainless steel cutlery to Mr. J. S. DARGAVEL on his marriage.

The Guildford Electricity Sub-Committee has made the following appointments: Installation superintendent, Mr. H. R. BILLING, Pontypridd; assistant mains superintendent, Mr. W. F. MAY, Maidenhead—both at £200 per annum, rising by annual increments of £12 10s. to £250. The Committee is this week interviewing candidates for the post of deputy borough electrical engineer; there were 170 applicants.

Bromley (Kent) Town Council has appointed Mr. E. R. SCOTT as temporary junior mains assistant at the electricity works at a salary of £200 per annum.

The Inverness Town Council has adopted a recommendation by the Electricity Committee that, in view of the increased work in the department, the salary of Mr. GRUT, the engineer and manager, be increased by £50 per annum, and by a further £50 at the end of twelve months.

The Motherwell and Wishaw Town Council has decided to grant an honorarium of a hundred guineas to Mr. W. D. BRASSINGTON, burgh electrical engineer, in recognition of his services in connection with the change-over to bulk supply at the Motherwell electricity works.

Mr. PICKIS, a partner in the firm of Richter & Pickis, exporters, returned to London last Friday after a business tour in Venezuela, Colombia, &c.

Lieut.-Colonel J. T. C. MOORE-BRABAZON, M.C., M.P., has accepted the invitation of the Council to become president of the Junior Institution of Engineers in succession to Sir Murdoch MacDonald, M.P. His induction will take place at a meeting on December 7th, when he will deliver his address.

The Oldham Corporation has increased the salary of Mr. F. L. OGDEN, borough electrical engineer, from £900 to £1,100 per annum.

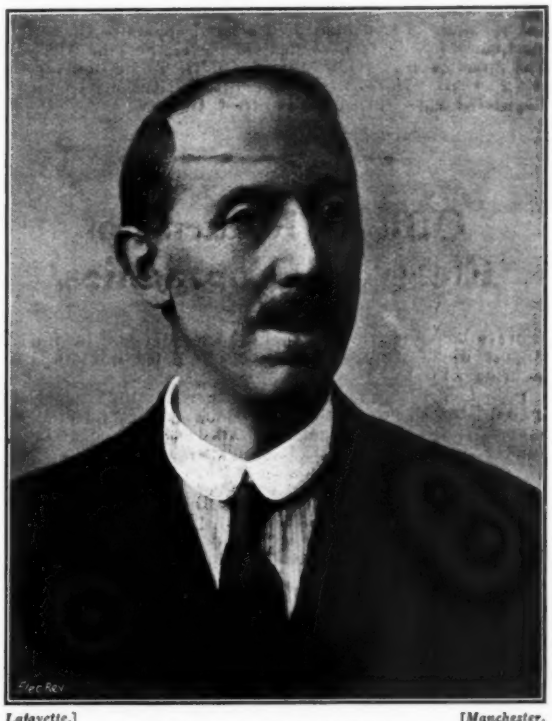
Messrs. E. G. C. SAUNDERS, of South Shields, and G. D. WARD, of Lancaster, have been appointed shift engineers in the Southport borough electricity department.

To-night (Friday) the staff of the Hull Corporation electricity department is giving a presentation to Major H. BELL at a farewell smoking concert.

The *Financial Times* states that M. DETHIOUX (Belgium) has been elected president of the World Telegraphic Conference at Brussels.

Mr. R. L. HORSFIELD, general manager of the Cardiff Corporation Tramways, is recommended for the appointment of tramways and transport general manager at Leeds in succession to Mr. Chamberlain, who is going to Belfast.

Obituary.—MR. H. MATTINSON.—The funeral of Mr. Henry Mattinson, general manager of the Manchester Corporation Tramways Department, took place at Disley on September 5th. As stated here last week his death occurred suddenly at the age of 52 years while away on holiday at Salcombe. Mr. Mattinson had been in ill-health contracted, we believe, during service rendered with the Egyptian Expeditionary Force during the war. He was responsible in that connection for important light railway construction work, and the restoration of hundreds of miles of captured railway, and he left the Forces holding the rank of major. He joined the staff of the Manchester Corporation Tramways Department in 1901, when the undertaking was being taken over from the company, and he had a good deal to do with the reconstruction of the track. In 1904 he was appointed permanent-way engineer and later civil engineer. When, in 1922, Mr. J. M. McElroy resigned owing to ill-health, Mr. Mattinson was appointed general manager, his title being subsequently altered to general manager and chief engineer. He accompanied Mr. McElroy on his visits to America and the Continent to study traffic conditions, which visits were made the subject of a joint report. Among his recent interests have been an express motor-'bus service, and plans for an underground railway system, for Manchester. He was a recognised authority on transport matters, was an



Lafayette.] [*Manchester.*

The late Mr. Henry Mattinson.

A.M.Inst.C.E., a member of the Institute of Municipal and County Engineers, of the Institute of Transport, and of the Executive of the Municipal Tramways and Transport Association, which is holding its 27th annual conference in Manchester this week. Alderman James Bowes, chairman of the Manchester Tramways Committee, is president of that Association, and he has paid a very high tribute to Mr. Mattinson after working with him for 21 years. At the Disley Churchyard on the occasion of the funeral the pathway was lined with tramway employés in uniform, from Manchester and Salford. The company present included many municipal officials from Manchester and tramway officials from Salford, Birkenhead, Sheffield, Blackpool, Preston, Accrington, Stockport, and other places, as well as representatives of the Transport and General Workers' Union.

MR. J. M. COLE.—The death took place on August 29th, from injuries received through being knocked down by a motor car, of Mr. J. M. Cole, secretary to the Paignton Electric Light Co.

MR. J. PUGSLEY.—Mr. Joseph Pugsley, founder and chairman of Messrs. Joseph Pugsley & Sons, Ltd., engineers and machinery merchants, Bristol, passed away on August 14th, and the business is being continued by the other directors.

Wills.—SIR JOHN I. THORNYCROFT, F.R.S., left £151,029 gross and £132,294 net personalty.

Mr. T. R. SMITH, tramways engineer of Leicester, left £15,864 gross, and £13,377 net, personalty.

Mr. J. R. WARD (Ward & Sons, electrical engineers, Wolverhampton), left £5,575 gross, and £1,085 net, personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Rotunda, Ltd.—Private company. Registered September 6th. Capital, £4,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in waterproofing and insulating materials and goods, electric wires and cables, &c. The directors are:—J. Irving, Westwoods, Broadway, Davenport, Cheshire, cable works manager; H. Hands, Woodside, Carr Wood Road, Bramhall, Cheshire, general manager (both permanent). Qualification, £100 shares. Registered office: Manchester Road, Denton, Manchester.

Clarmac Engineering Co., Ltd.—Private company. Registered in Edinburgh on August 30th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and repairers of switchboards, electrical apparatus, motors or machinery for light, heat, motive power, or otherwise, &c. The directors are:—G. J. L. Brown, G. T. McGlashan, and G. S. Clark, 219, St. Vincent Street, Glasgow, engineers. Registered office: 108, Douglas Street, Glasgow, C.2.

Official Returns of Electrical Companies.

Maybrook Electrical Co., Ltd.—Satisfaction in full on August 22nd, of prior lien debenture dated July 5th, 1928, securing £1,000.

Prior lien debenture dated August 25th, 1928, to secure £2,000, charged on the company's undertaking and property, present and future, including uncalled capital and a sinking fund policy. Holders: H. L. Faulkner and J. S. Faulkner, 17, Warham Road, Croydon.

Electric Motor Supplies, Ltd.—Mortgage on 1, John Street, Huddersfield (leasehold), dated August 30th, 1928, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £2,000.

G. J. Scragg & Co., Ltd.—Mortgage dated August 25th, 1928, to secure £676 16s. and any further advances, charged on Grimsby House, Market Street, Abergele, Denbighshire. Holders. Halifax Building Society, Permanent Buildings, Halifax.

Chesham Electric Light and Power Co., Ltd.—Satisfaction in full on July 31st, 1928, of debentures dated July 22nd, 1921, securing £35,000.

Fry & Co., Ltd.—Satisfaction in full on April 30th, 1928, of debenture dated November 15th, 1923, securing £500. (Notice filed August 31st.)

Mexican Hydro-Electric Development Syndicate, Ltd.—Issue on August 10th, 1928, of £750 debentures, part of a series already registered.

Electric Conductors and Colours, Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st 1927 (filed April 26th, 1928). 2,002 shares taken up. £627 paid, being 12s. 6d. per share on 1,000 and £1 per share on 2. £1,000 considered as paid on 1,000 shares. Mortgages and charges, nil.

Thanet Electric Factors, Ltd.—Capital, £500 in £1 shares. Return dated April 4th, 1928. 376 shares taken up. £252 paid, £124 considered as paid. Mortgages and charges, nil.

Ringwood Electric Supply Co., Ltd.—Capital, £15,000 in £1 shares. Return dated June 18th, 1928. 10,000 shares taken up. £9,933 paid, leaving £67 in arrears. Mortgages and charges, £14,075.

Birkdale and District Electric Supply Co., Ltd.—Capital, £50,000 in £5 shares. Return dated May 3rd, 1928. 9,200 shares taken up. £46,000 paid. Mortgages and charges, £25,000.

Lisbon Electric Tramways, Ltd.—Capital, £1,500,000 in 500,000 preference and 1,000,000 ordinary shares of £1 each. Return dated June 27th, 1928. 425,553 preference and 939,400 ordinary shares taken up. £134,026 paid on 134,026 ordinary shares. £1,230,927 considered as paid on 425,553 preference and 805,374 ordinary shares. Mortgages and charges, £460,800.

Whitehall Electric Investments, Ltd.—Capital, £7,500,000 in 2,500,000 preference and 5,000,000 ordinary shares of £1 each. Return dated July 5th, 1928. All shares taken up. £2,500,007 paid on 7 ordinary and 2,500,000 preference shares. £4,999,993 considered as paid on 4,999,993 ordinary shares. Mortgages and charges, £3,274,248.

Dalgetti Electric, Ltd.—Capital, £500 in £1 shares. Return dated June 25th, 1928. 150 shares taken up. £150 considered as paid. Mortgages and charges, nil.

Barrow & Co., Ltd.—Capital, £5,000 in £1 shares. Return dated June 28th, 1928. 1,619 shares taken up. £19 paid. £1,600 considered as paid. Mortgages and charges, nil.

Embleton & Barker, Ltd.—Capital, £1,000 in £1 shares. Return dated May 29th, 1928. All shares taken up. £500 paid. £500 considered as paid. Mortgages and charges, nil.

Merthyr Electric Traction and Lighting Co., Ltd.—Capital, £100,000 in 6,000 preference and 14,000 ordinary shares of £5 each. Return dated May 3rd, 1928. 6,000 preference and 13,000 ordinary shares taken up. £95,000 paid. Mortgages and charges, £48,400.

Lewes and District Electric Supply Co., Ltd.—Capital, £50,000 in 2,500 preference and 2,500 ordinary shares of £10 each. Return dated May 3rd, 1928. 2,327 ordinary shares taken up. £23,270 paid. Mortgages and charges, £20,000.

A. W. Griffin & Co., Ltd.—Debenture dated August 21st, 1928, to secure £400 charged on the company's undertaking and property, present and future, including uncalled capital. Holders: V. W. and Mrs. R. A. Turner, Sambourne, Warwick.

Rheostatic Co., Ltd.—Capital, £12,000 in £1 shares. Return dated July 16th, 1928. 10,062 shares taken up. £7,783 paid, £2,279 considered as paid. Mortgages and charges: £3,381 3s. 5d.

Castle Fuse and Engineering Co., Ltd.—Capital, £15,000 in £1 shares. Return dated June 25th, 1928. All shares taken up. £12,998 paid, £2,000 considered as paid, £2 calls unpaid. Mortgages and charges, nil.

Sheerness and District Electric Supply Co., Ltd.—Capital, £75,000 in £1 shares. Return dated May 3rd, 1928. All shares taken up. £75,000 paid. Mortgages and charges, nil.

Hardman & Co., Ltd.—Capital, £500 in £1 shares. Return dated June 30th, 1928. 480 shares taken up. £480 paid. Mortgages and charges, nil.

Richson & Co. (1925), Ltd.—Capital, £15,000 in £1 shares. Return dated July 24th, 1928. 14,660 shares taken up. £2 paid, £14,658 considered as paid. Mortgages and charges, nil.

Plessey Co., Ltd.—Capital, £20,000 in 16,000 preference shares of £1 each and 80,000 deferred shares of 1s. each. Return dated June 6th, 1928. 16,000 preference and 60,002 deferred shares taken up. £1,550 2s. paid on 31,002 deferred shares, £17,450 considered as paid on 16,000 preference and 29,000 deferred shares. Mortgages and charges: £15,200 (covered by debenture).

Magnetic Separators, Ltd.—Capital, £500 in £1 shares. Return dated June 18th, 1928. All shares taken up. £500 paid. Mortgages and charges, nil.

Electric and Radio Supplies, Ltd.—Capital, £100 in £1 shares. Return dated March 15th, 1927, filed July 9th, 1928. 16 shares taken up. £16 paid. Mortgages and charges, nil.

Kingsmill Art Metal & Electrical Co., Ltd.—W. H. Dunn, of 57, Lodge Road, Croydon, was appointed receiver and manager on August 28th, 1928, under powers contained in instrument dated November 13th, 1924.

City Notes.

General Electric Co., Ltd.

An extraordinary general meeting was held at Magnet House on September 7th. Mr. E. G. Byng (vice-chairman) occupied the chair in the absence abroad of Sir Hugo Hirst, Bt. After the secretary had read the notice calling the meeting, which embodied the resolutions quoted in full in our last issue (p. 411), the chairman said that, as the shareholders were aware, Sir Hugo Hirst, following a call from our and the Australian Government, was at present on his way to Australia, and, whilst taking full responsibility for calling that meeting and its objects, he wished the speaker to express his regret at his unavoidable absence. In his speech to the shareholders on July 3rd, Sir Hugo referred to the favour which the company's shares at present enjoyed in foreign markets. He said: "We believe the electrical industry is destined to play a most important part in the development of Empire. We believe our company holds a marked and leading position in British electrical industry, and it might cause great embarrassment some day if it were found out that too big a proportion of shares is held in non-British hands. I am speaking not from the personal but from the entirely national point of view. We therefore propose to watch, so far as we can, the progress of this movement, and, should we find that an undue proportion of our shares wanders into foreign possession, it may be necessary to introduce measures which will keep that movement in check within certain proportions, so that the control at all times shall remain with British shareholders residing within the Empire." Since that statement, the number of shares held by banks in favour of shareholders not disclosed, had considerably increased. They might be held in favour of British or non-British shareholders; they did not know, nor could they find out definitely, but they had good reason to believe that a large proportion were held for non-British interests. In consequence, under the chairmanship of Sir Hugo Hirst, a board meeting was held at which the resolutions framed by the company's legal advisers were approved, and they were now submitted for approval. The resolutions had been submitted to and approved by the Stock Exchange Committee. He would like to emphasise that they were most happy in the business and trading agreements which they had with electrical friends in almost every country. It would be their endeavour to strengthen those agreements whenever an opportunity arose. They were most anxious to help in the removal of insane and uneconomic competition in the world's markets; yet, in spite of those ideals, they felt that their proposals were necessary in the national interests as well as those of their great company. He therefore proposed that the resolutions as set out in the notice convening the meeting be adopted. Mr. M. J. Railing seconded the motion, and the resolutions were carried.

Crompton-Parkinson, Ltd.

The report for the first fifteen months of this company's operations (ended June 30th last) has been issued. It shows that after providing for depreciation, debenture interest, &c., there was a net profit of £70,826, to which was added £25,600 brought forward, making £96,426. After meeting the preference and preferred ordinary dividends, it is proposed to pay a final dividend of 7s. 6d. per share on the deferred ordinary shares, making 10s. for the period. A balance of £44,550 is carried forward. During the year Col. Hale, Mr. J. A. Rennie, and J. D. Siddeley retired from the board, and Messrs. C. Cooper, F. Parkinson, and A. Parkinson were appointed directors. The meeting is to be held on September 20th.

Edmundsons' Electricity Corporation, Ltd.

At a special meeting on Monday last the resolutions passed on August 23rd were confirmed. These provide for the raising of the capital to £1,650,000 by the creation of 850,000 ordinary shares; for the capitalisation of £600,000 of the reserves; and for alteration of the basis of the directors' remuneration.

Stock Exchange Notice.

Dealings in the following have been specially allowed by the Stock Exchange Committee under Rule 159:—

Underground Electric Railways Company of London.—15,332 ordinary shares of £1 each, fully paid, Nos. 5,608,764 to 5,624,095.

Aldershot Gas, Water and District Lighting Co.

Interim dividends at the rates of 5 27/40 per cent. and 4 7/40 per cent. have been declared on the "A" and "B" consolidated stocks respectively.

Victoria Falls and Transvaal Power Co., Ltd.

The directors announce that the net earnings of the company for the quarter ended June 30th last, before providing for taxation, amounted to £282,011.

Pritchett & Gold & E.P.S. Co., Ltd.

An interim dividend at the rate of 10 per cent. per annum (against *nil* in 1927) has been declared, free of tax, on the ordinary shares.

Globe Telegraph and Trust Co., Ltd.

The usual quarterly dividend of 5s. per share, free of tax, has been declared.

Farnham Gas & Electricity Co., Ltd.

The directors have again declared an interim dividend of 3¾ per cent. on the ordinary shares.

Western Telegraph Co., Ltd.

The directors have declared a dividend of 5s. per share, free of tax, in respect of the quarter ended June 30th last.

Barcelona Traction, Light and Power Co.

A quarterly dividend of 1¾ per cent. has been declared on the non-cumulative participating preference shares.

Stewarts & Lloyds, Ltd.

An interim dividend at the rate of 10 per cent. per annum has been declared on the preferred ordinary shares.

Stocks and Shares.

MONDAY EVENING.

THE general condition of Stock Exchange markets may be described as satisfactory, and, with a fair amount of business going on, the open speculative account remains so small as to give rise to no feeling of uneasiness. Nor is the money market troubling the Stock Exchange to any extent at the present time. Rates in New York have gone ahead abruptly, without affecting conditions on this side to any noticeable extent. Business in American industrial shares expands almost daily, and instead of the Americans coming over here to buy shares, as has been the case for nearly six months, the position at the moment is reversed, and British investors, as well as speculators, are taking a lively interest in American industrials. New issues are starting to put in an appearance, and, while the August output of fresh arrivals seemed to be small, examination of its details shows that the number of companies launched, and the amount of capital required by them, was unusually large for the holiday month.

Electricity Supply.

Electricity supply shares reproduce the same condition of the Stock Exchange market as prevailed last week: that is to say, the tendency is a little dull, though a fair amount of support is available to take shares which happen to come in at what seem to be reasonable prices. North Metropolitans are 2s. 6d. better at 50s. 3d. Several small gains have occurred in the lighting list, Chiswick shares, for instance, advancing to 60s. 9d., and Northamptons to 43s. Scottish Power, in which there has been a good deal of mild speculation, lean to the dull side. The new shares drooped to 5s. 3d. premium. Newcastle-on-Tyne ordinary and Yorkshire Electric Supply hardened to 26s. 3d. and 36s. 6d., respectively. Isle of Thanet ordinary at 36s. 6d., and the preference at 29s. 3d., keep firm. London Electrics are 1s. higher at 28s. 6d., following up the rise of last week. Midland Electric Power gave way to 42s. 6d. County of London retain their substantial gain, at 40s. 6d., and City "Lights" are good at 33s. 3d.

South Wales Power.

Occasion was taken to indicate the appearance in the market of a few thousand pounds South Wales Electric ordinary stock—one of those securities that are rarely seen, and, therefore, seldom obtainable. The stock could have been bought at 75 or thereabouts. The amount quickly found a home upon attention being drawn to it, and the earlier buyers were offered a quick profit of seven points. It would seem as though this held no particular attraction, for the cheapest price at which stock is available, at the moment, is 85. No dividend, it may be repeated, has yet been paid on the stock, but the chairman made a guarded reference, at the last meeting, to the possibility of a small distribution in the near future. And, as everyone knows, popular demand has run eagerly for some time past upon shares in similar undertakings.

Marconis.

The last day for conversion of Marconi debenture into £1 shares has now gone. It would be of melancholy interest to know the number of Marconi debenture stockholders who neglected to take advantage of their opportunity to make the exchange, and who have therefore lost at least £60 on each £100 stock. The company very fairly issued an advance notice drawing attention of proprietors to the near advent of the day upon which the conversion rights lapsed. Here, and elsewhere in the Press, earnest recommendations were made in reference to the dangers of delay. Long experience has demonstrated, however, the apathy with which some investors regard their chances of making money. Marconi £1 shares are firm at 5, and the 10s. shares, after touching 69s. 9d., reacted to 68s. 9d. Profit-taking reduced the price of Canadian Marconis, after their rapid rise, to 30s. 6d.; Marines rallied to 51s.

Home Railway Stocks.

Underground Electrics are an erratic market, the price of the income bonds—upon which that of the shares depends—moving actively between 129 and 131. At 130, the bonds are a point higher on the week, and the shares are 6d. up at

27s. 6d. Metropolitan Consolidated has risen 1 to 67½. Rumour is once more busy with talk of the Metropolitan Railway being taken over by the Underground Combine. We have mentioned here, and on more than one previous occasion, that the optimists look for Metropolitan ordinary to receive something like 75, either in cash or in stock that will approximate this value. The market in Metropolitans is at all times very restricted: hence the abruptness of movements when buyer or seller becomes definitely dominant. Districts are rather neglected, and the price shows no change at 79½.

Hydro-Electrics.

The jump of 16 points, which took Mexican Light and Power shares to 87 last week, brought in a few sellers, and the price reacted to 84½. Mexico Trams at 39 are down 1½. Hydro-Electrics gave way to 35½, but their stable companions, International Holdings, have strengthened to 15½. There is considerable division of opinion as to the merits of these last two, but those who claim to have made a close study of the companies maintain that the break-up value of the International Holdings is equal to at least the current market price for the shares. Brazilian Tractions are easier at 59½. A gain of 3 has lifted Pennsylvania Water & Power capital stock to 86½. Canadian demand for utility descriptions is not quite so pronounced as it has been recently.

Cable Stocks.

In this group, Gt. Northerns are better at 38¾, Continental buyers supplying the motive power. Anglo-American Telegraph preferred improved to 104, yet the deferred stock, the security of which is very little different from that of the preferred, went back to 24. Western Telegraphs have gone up to 24¾. A decline of 2½ in Eastern Telegraph ordinary stock is more nominal than real, though the present price of 247½ represents with greater accuracy the market quotation than 250 did.

Stock Exchange Quotations.

In this connection, attention may be directed, again, to the unduly wide prices at which hundreds of stocks and shares are officially quoted in the Stock Exchange Daily List. Amongst telegraphs and telephones, the practice of wide margins is carried to excess. The figures given in our own lists are the middle prices sent out in the Stock Exchange Official List every Monday night. The margin between the nominal selling price and buying price in the case, for instance, of Eastern Extension shares, is £1. Yet the margin in the actual dealing-price of Eastern Extensions is no more than 3s. 9d. per share. Sometimes the margins are wider: sometimes they are narrower: circumstances determine whether jobbers can make close prices or others that are not so close. But there is no rhyme or reason why Eastern Extensions should be quoted officially with £1 margin between selling and buying levels. The quotations are misleading and give a false impression both as to the real market price and, also, the amount of "turn" expected as their profits by dealers in the issues. Reform in the direction of narrowing the official prices is urgently needed, and may be politely recommended to those whose duty it is to furnish the quotations from which the Daily List is made up. To-day, Monday, a timid step has been taken in the way of reform, Eastern ordinary stock being quoted at a difference of 5 points, instead of 10 as of late. But the shares, Eastern Extension, Westerns and Globes are still quoted, officially, at ridiculously wide prices.

The Manufacturing Group.

General Electrics hold their gain at 41s., and the necessary steps have now been taken to secure that the control of the company shall remain in British hands. Slight declines occurred in British Insulated, Callenders, and Metropolitan-Vickers ordinary shares. No particular selling pressure was noticed, but the prices in this group have reached levels that look tolerably high on the basis of the last-paid dividends. Brush ordinary went back to 27s. 6d.; on the other hand, Edison Swan 5 per cent. debenture stock at 89½ is 30s. to the good. There seems to be no stopping the buoyancy of British Aluminium ordinary, which, at 48s. 3d., are a florin up. A line of about £10,000 General Electric 7 per cent. mortgage debenture stock is on offer at 106¾ *cum* the interest due this month. There is a cumulative sinking fund in operation for drawings of the stock at par, so that a holder may have the unpleasant experience of finding his stock redeemed at 100. The latest date for repayment of this stock is 1953, but the company has the right to repay it, at 100, at any time after 1931. Were it not for these provisions, the price would stand points higher, because the security is first-rate. British Thomson-Houston 7 per cent. mortgage debenture stock is on offer at 107¾. The sinking-fund for repayment of the stock at 100 has been in operation since 1922. Tokyo Electric Light 6 per cent. first mortgage bonds to bearer can be bought at 94½, giving 6⅜ per cent. on the money. The first coupon-payment, of 45s. per cent., falls due on December 15th this year.

Miscellaneous.

Iron and steel shares are a trifle easier, and the rubber market continues on the down-grade. Rubber is a heavy market and Mincing Lane appears to be nonplussed at the prospect of what may happen when restriction of output comes off on November 1st.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Dividend. 1926.	1927.	Price Sept. 10, 1928.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	14†	15	3⅜	—	... ...
Brompton Ordinary	1	8⅝	8½	27/-xd	—	5 3 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 3 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅝	8⅝	27/6	—	5 1 10
City of London	1	10	10	34/3xd	—	4 4 4
do. do. 6% Pref.	1	6	6	23/-xd	—	5 4 4
Clyde Valley	1	8	8	37/6	—	4 5 3
County of London	1	7½	7½	40/6	—	3 14 3
do. do. 6% Pref.	1	6	6	23/6	—	5 2 2
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	2⅝	+1/16	4 5 9
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	30/-	—	5 0 0
London Electric	1	8½	8½	28/6	+1/-	4 18 3
Metropolitan	1	8	9	48/3	—	3 13 9
do 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	31/6	—	4 2 6
Mid. Elec. Power	1	—	15	42/6	—1/16	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	26/3	+6d.	4 11 5
do. 7% Pref. ...	1	7	7	27/-	—	5 3 8
Notting Hill 6% Pref.	10	6	6	10⅜	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	32/6	—6d.	4 18 6
South London	1	8½	8½	27/-	—	5 3 8
Urban Ordinary	1	7	7	35/-	—	... ...
Westminster Ordinary	1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	24/-	—	6 5 0
Yorkshire Elec.	1	8	8	36/6	+6d.	4 7 8

Home Rails.

Central London Ord. Assented ...	Stock	4	4	72xd	—	5 11 1
Metropolitan	,,	3	3	67½	+1	4 9 0
do. District	,,	3½	4	79½	—	5 0 8
Underground Electric	£1	1½	5	27/6xd	+6d.	8†12 9
do. do. Income ...	Bonds	6	6	130	—1	4 12 4

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	104	+⅛	5 15 5
do. Def.	,,	1½	1½	24	—¼	6 5 0
Automatic Telephone	1	10	10	43/9	—	4 9 0
Eastern Extension	10	10	10	25	—	*4 0 0
Eastern Tel. Ord.	Stock	10	10	247½	—2½	*4 0 10
Globe Tel. and T. Ord.	10	10	10	24½	—	*4 1 8
do. do. Pref.	10	6	6	11⅛	—	5 7 10
Great Northern Tel.	10	20	20	38⅜	+¼	5 3 0
Indo-European	25	10	10	46½	—	*5 7 6
Marconi	10/-	5	*10	3⅞	—	... ...
Marconi-Marine	1	8½	12½	51/-	+6d.	4 18 0
Oriental Telephone Ord.	1	12	12	56/3	—	*4 5 3
United R. Plate Tel.	5	8	8	9⅞	—	*4 1 0
Western Telegraph	10	10	10	24¾	+⅜	4 0 4

*Interim.

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8⅜	—	7 11 9
do. do. 2nd. Pref. ...	5	6	6	8½	—	8 11 6
do. do. 5% Deb. ...	Stock	5	5	78½	—	6 7 5
British Electric Traction Def. Ord.	,,	—	—	520	—	... ...
do. do. Pref. Ord.	,,	8	7½	125	—	6 0 0
Brazil Traction	100	6	7	59½	—1	2 18 10
Brit. Colombia Elec. Rly. Pcs. ...	Stock	5	5	90½	—	5 3 9
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/6	—	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 13 3
Mexico Trams, 5% Bonds	—	5	5	78	—1	6 8 2
Mexican Light Common	100	Nil	Nil	84½	—2½	... ...
do. 7% Pref.	100	Nil	7	77½	—	9 0 8
do. 1st Bonds	—	5	5	79½	—1	6 5 9
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...

Manufacturing Companies.

Babcock & Wilcox	1	18	15	67/6	—	*4 9 0
British Aluminium Ord.	1	10	10	48/3	+2/-	*4 3 0
British Elec. Transformer Pref....	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4⅞	—⅛	3 11 9
Brush Ord.	1	10	10	27/6	—⅛	7 5 6
Callenders	1	15	15	4⅞	—⅛	3 14 0
do 6½% Pref.	1	6½	6½	26/9	—	5 9 5
Crompton Parkinson Pref Ord. ...	1	—	6	17/6	—	6 17 2
do. 8% Pref.	1	—	8	26/3	—	6 2 0
Edison-Swan	4/-	10	10	12/6	—	3 4 0
do. 5% Deb.	Stock	5	5	89½	+1½	5 11 9
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Ord.	1	20	20	4¼	—	4 11 6
English Electric	1	Nil	Nil	7/6	—	... ...
do. do. Pref	1	3	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/6	—	5 6 1
do. Ord.	1	7½	10	41/-	—	4 17 7
Henley	1	25	25	5½	—	4 11 0
do. 4½% Pref.	5	4½	4½	41xd	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	12½	10	2	—	5 0 0
Met.-Vickers Ord.	1	8	6	33/3	—6d.	3 12 3
do. Pref.	2	8	8	2⅜	—	6 1 11
Siemens Ord.	1	7½	7½	28/9	—	5 4 4
Telegraph Construction	12	10	10	24½	—	*4 18 6

*Dividends paid free of Income Tax.

†4% of which was tax free.

The British Association—II.

The Glasgow Meeting.

THE 1928 meeting of the British Association for the Advancement of Science, which took place in Glasgow, closed on Wednesday last. The attendance was a little over 3,000, which is well up to the average. In 1930, the meeting will be held in Bristol and an invitation to hold the meeting in Leicester in 1932 has been accepted. Next year, of course, South Africa is to be visited, but as regards 1931, which is the centenary year, no definite decision as to the place of meeting has been arrived at yet.

As we said last week, there were a few directly electrical papers in Section G (Engineering) as well as several of indirect interest to our readers to which we shall call attention. Matters of more scientific and commercial interest were raised in other Sections, such as Section A (Mathematical and Physical Sciences), Section F (Economic Science and Statistics), and Section J (Psychology), and we shall refer to these also.

A feature of the Glasgow meeting was that all the sessions of the various Sections were held under one roof in the University, a convenient state of affairs which probably has never occurred previously.

Following the usual custom, the Presidential Address to the Association by Prof. Sir William H. Bragg, K.B.E., F.R.S., (which was abstracted in our last issue) was delivered in the evening before the opening of the sectional meetings, *viz.*, Wednesday, September 5th, and the St. Andrew's Hall, Charing Cross, was crowded with an audience which did not fail to show its appreciation of Sir William's exposition of craftsmanship and science in which he gave us his characteristic blend of scientific and practical qualities not always to be associated with the utterances of men in the first rank of scientists.

On Thursday, September 6th, a long and interesting discussion took place upon the education of the engineer in Section G, of which we give some extended notes elsewhere. This discussion occupied the greater part of the morning.

In Section A (Mathematical and Physical Sciences) Dr. Ezer Griffiths, F.R.S., and Mr. J. H. Awbery gave an interesting account of some experimental work which they are doing upon the measurement of flame temperatures. Two methods have been employed for the measurement of a homogeneous flame. In one, a refractory metal in the form of wire is heated electrically *in vacuo*, and the relation between temperature and heating current determined by an optical pyrometer. The same wire is then inserted in the flame, and the relation between temperature and heating current again determined. When the results are plotted graphically, the point of intersection of the two lines will give the temperature of the flame, for at the temperature represented by this point the electrical supply is sufficient to balance the radiation loss, whether the wire is *in vacuo* or in the flame, so that the surrounding gas in the flame neither imparts nor abstracts heat to or from the wire. Experiments have been made using wires of different diameters, and these have given identical values for the temperature of the flame investigated within the limits of experimental error. In the second method a beam of light from an incandescent tungsten sphere was focused through the flame on to the slit of a spectroscope. Sodium was introduced into the flame, and when the temperature of the flame was greater than that of the tungsten sphere, bright sodium lines showed up on a continuous spectrum background. If the temperature were lower, reversal of the sodium lines took place. By careful adjustment of the temperature of the tungsten sphere a point was reached when all trace of either bright or dark lines disappeared. This balance could be effected within a range of a few degrees. The corresponding temperature of the sphere was then determined by means of an optical pyrometer.

A noteworthy feature of this method of measuring temperature is that it is devoid of "time lag," and so, for example, may prove of value in measuring temperatures in the explosion cycle of an internal-combustion engine.

Mr. Sam Mavor (of Messrs. Mavor & Coulson, Ltd.) read before Section F (Economic Science and Statistics) a short paper on "Suggestion Schemes as a Means of Promoting Individual Co-operation among Workpeople," a much criticised subject and one not always welcomed either by employers or men for various reasons. Mr. Mavor, however, showed that, properly managed, this was a method of co-operation which could be made very helpful. National Councils and committees of representatives of capital and labour, he said, meeting in London, might do much to improve industrial relations; the degree would depend chiefly on the willingness of both sides to sacrifice to the common cause present advantages, real or supposed. When national negotiating bodies had done their best, there would remain the real and basic task of giving in the workshops practical expression and effect to the awakened spirit of goodwill and co-operation. A condition essential to the success of efforts in that direction was that a firm's relations with its employés should be inspired by human sympathy and consideration for the interests of the workers, and that all dealings should be governed by consistent fairness. Where that fundamental condition existed, many methods of promoting co-operation of the workers were practised with success, but he submitted that one of these—suggestion schemes—had received less attention than it deserved. The purpose of a suggestion scheme was to induce workpeople to apply their intelligence to the work in hand, and to suggest how time, effort, or material might be saved in the doing of it. It was probably true to say that the greatest source of waste in the engineering industry was the comparative stagnation of the reservoir of latent mental abilities and mechanical aptitudes of the men in the workshops; the sluices should be opened, and streams of ideas should be made available for enhancing the workers' earnings and for reducing the cost and improving the quality of the products. Management had not a monopoly of brains; workmen ought to be paid for thinking, and it was worth while so to pay them. It had been complained on behalf of the workers that under modern workshop conditions they did not have opportunity for self-expression, and that that was a cause of much industrial unrest. A suggestion scheme provided the workman with wide scope for his legitimate and laudable ambition to exercise his creative abilities, and to stamp his own individuality upon his work; it was a channel through which he could make personal contributions to technical progress, and so have a conscious share and proper pride in promoting the general advance, while reaping immediate and appropriate reward for his effort. The fuller exercise of his faculties was a source of pleasure to a workman; it increased his self-respect, and enabled him the better to realise his place in the industrial and social structure. Suggestion schemes contained large possibilities of fostering goodwill and practical co-operation of the workpeople, and of promoting industrial harmony; they provided opportunities to the workers of increasing the value of their contribution to industry and of enhancing their earnings by adding the work of their heads to the work of their hands.

On Thursday afternoon, Section G paid a visit to the Falls of Clyde (Lanarkshire) hydro-electric power station.

Sir William Ellis, president of Section G, delivered his address on September 7th. Sir Oliver Lodge, in proposing a vote of thanks, touched on the question of road and rail transport competition and prophesied the day when road vehicles would be carried by rail to the nearest point and placed on the road to continue their journey to the more remote parts.

The remainder of the morning in Section G was devoted to the reading and discussion of a paper by Mr. H. E. Yarrow on "Recent Developments in High Pressure Boilers," which, although primarily concerned with marine work, had a good deal to say with regard to the subject of high pressures and temperatures for boilers generally.

In Section A (Mathematical and Physical Sciences) Mr. J. Thomson described experiments in which electrical methods were employed to detect the radiations emitted by the gas in a spark discharge, and to measure their intensities. The experiments showed (*a*) the variation of the intensity of the radiations at a distance from the source when the pressure of the gas in the discharge tube was varied and the spark current was kept constant; and (*b*) the variation of the intensity when the discharge current was varied and the pressure was maintained at a constant value. The evidence so far collected appeared to indicate that the radiations were due to the impact of ions on neutral molecules.

Section J (Psychology) concerned itself on September 6th and 7th with matters affecting vocational guidance and selection, and the alluring topic of the psychological make-up of the business executive. The discussions did not include any specific references to the electrical industry. Nevertheless, the problems dealt with have some interest for everybody, although for a full account of what took place we refer our readers to those special channels of publication which exist for dealing with these matters.

High-frequency Railway Traction.

By Prof. W. CRAMP, D.Sc., M.I.E.E.

(*Abstract of paper read before Section G.—Engineering.*)

The ease with which alternating current may be transmitted by induction raises the possibility of the use of high-frequency power for electric traction. The elimination of all overhead-wire and third-rail sliding-contact energy collectors, with their limitations and disadvantages, would certainly outweigh the disadvantages of a.c. traction motors, but the transmission of power by a.c. at ordinary frequencies might interfere with neighbouring telephone and telegraph lines, so that the choice of a suitable periodicity would be of importance.

In 1896 Ayrton and Perry proposed inductive traction, but the tested power factor of the system was too low to make the scheme commercially practicable.

In 1922 Mr. Maurice Leblanc revived the idea in a different form.* However, the necessity for an overhead line made up of tubular condensers, not to mention the space required to accommodate the apparatus on the train, would doom his ingenious system to failure.

It occurred to the author, four years ago, that if constant resonance were maintained by varying frequency, instead of varying inductance, the scheme would be simplified. This would entail a high-frequency generator, or convertor, delivering power at a frequency determined by the circuit constants. Such a generator is the Poulsen arc, for within wide limits of the ratio $\sqrt{L/C}$, and except for small variations due to arc length and resistance, the oscillation frequency is substantially determined by the natural period of the circuit, and resonance is automatically maintained. If, in addition, we can rectify a current of such high frequency, ordinary direct-current motors can be used on the vehicle. At the generating end direct current would be supplied to a Poulsen arc, which in turn would feed a pair of overhead strips or tubes. On the vehicle, a pair of tubes parallel with the overhead system would feed the direct-current equipment through an arc rectifier.

Three questions require answers:—

(1) Can an overhead system of the type proposed act as an efficient power transformer?

(2) Can the Poulsen arc be developed into a reliable and efficient generator for these purposes?

(3) Will an arc rectifier operate at frequencies of 20,000 and upwards?

To these three questions a team of research students have been devoting themselves at Birmingham University, and, although the work is far from complete, sufficient information is available to make a statement of interest.

It is necessary first to understand the consequences of working with resonant circuits. Let V be the vector P.D. supplied at frequency f across the primary of a transformer having an air core. Let R_1 and R_2 be the whole resistance in the primary and secondary circuits, respectively. Let X_1 and X_2 be the Maxwell inductive reactances of the primary and secondary, and X be the Maxwell mutual reactance. Let S_1 and S_2 be the capacity reactances in the primary and secondary circuits, respectively. Then the two fundamental equations with sinusoidal wave $\mathbf{V} = \mathbf{I}_1\{R_1 + j(X_1 - S_1)\} + j\mathbf{I}_2 X$ and $0 = \mathbf{I}_2\{R_2 + j(X_2 - S_2)\} + j\mathbf{I}_1 X$ lead to the solution—

$$\mathbf{V} = \mathbf{I}_1\left[R_1 + \frac{R_2 X^2}{R_2^2 + (X_2 - S_2)^2} + j\left\{(X_1 - S_1) - \frac{X^2(X_2 - S_2)}{R_2^2 + (X_2 - S_2)^2}\right\}\right]$$

Thus if $\mathbf{V}$ and $\mathbf{I}_1$ are always to be in phase, either $X_1 = S_1$ and $X_2 = S_2$, or S_1 and S_2 must be so adjusted that

$$S_1 = X_1 - \frac{X^2(X_2 - S_2)}{R_2^2 + (X_2 - S_2)^2}.$$

This might be accomplished for instance, with $S_2 = 0$ and $S_1 = \{X_1 - X^2 X_2/(R_2^2 + X_2^2)\}$, the whole of the capacity being on the supply side. If the first method be adopted the final result is:

$$\mathbf{V} = \mathbf{I}_1\left[R_1 + \frac{X^2}{R_2}\right] = j\mathbf{I}_2\left[\frac{R_2 R_1}{X} + X\right] \quad . \quad . \quad . \quad (1)$$

and

$$\mathbf{I}_2 = -\frac{j\mathbf{I}_1 X}{R_2} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

The second method ($S_2 = 0$) is not so good, although, for the present purpose, there is a practical advantage in tuning one circuit only. The equations are:

$$\mathbf{V} = -\mathbf{I}_2(X_2 - jR_2)\left\{\frac{R_1}{X} + \frac{R_2 X}{R_2^2 + X_2^2}\right\} \quad . \quad . \quad . \quad (3)$$

$$\mathbf{I}_2 = \frac{-\mathbf{I}_1 X(X_2 + jR_2)}{R_2^2 + X_2^2} \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

Equations (1) and (2) show that (*a*) the primary current and voltage are always leading the secondary current by $\pi/2$; (*b*) since R_1 must be relatively small for high efficiency, an increase of secondary current can only be obtained by an increase of primary volts; (*c*) constant secondary induced e.m.f. involves constant primary current. Thus this variable-frequency system transforms constant primary current with variable primary voltage into constant secondary voltage and variable current, very much like a quarter wave-length transmission line. The vector diagram is given in fig. 1. Equations (3) and (4) show a very similar result, but the secondary current now lags behind the secondary induced voltage. It follows that the overhead line, and therefore the arc generator, must deliver a constant current with varying pressure. Since it is desirable that the ratio of high-frequency current to direct current in the arc should remain constant, the whole system will best be fed from a constant-current direct-current generator. Thury transmission shows that this entails no insuperable difficulty, especially since the very great pressures which Thury adopted will not here be required.

This leads at once to the first question: Can an overhead system, when fed with high-frequency constant current from an arc, act in conjunction with a suitable moving secondary as an efficient power transformer? In order to give a definite answer to this question, an Elwell-Poulsen arc of 3-4-kW capacity was arranged as shown in fig. 2: the primary and secondary loops each consisted of a pair of copper tubes of 1.9 cm. radius, suspended from the laboratory ceiling in two horizontal planes; the primary pair was uppermost, and the secondary was exactly similar to the primary, parallel to it, and 21 cm. below. The horizontal distance between the conductors of either loop was 125 cm., and the length of each loop was 23.2 m. Fig. 2 shows a series tuning inductance in the primary, which was included so that the frequency could be altered from 20,000 to 67,500 cycles per second. The primary current was kept constant for each test, the load being varied. It is not possible here to give the whole of the results obtained, which were entirely consistent, but Table I shows the transmission efficiencies at the maximum load for each frequency. At the same time, measurements were taken to enable the efficiency of the arc generator plus the transmission to be checked, and this figure is referred to later.

Table I.

Primary current Amps.	Frequency.	Load Watts.	Efficiency of transmission per cent.	H.
1	2	3	4	5
20.6	19,700	1,030	88	2,440
20.6	28,000	800	91	1,790
14.2	42,000	800	91	2,340
14.2	52,700	1,290	93.5	2,800
12.3	67,500	970	94.1	1,940

The transformer efficiency is very good, and is improved with increase of frequency; it is probable that at 100,000 cycles per second it would be in the neighbourhood of 98 per cent., even for this small set, and from the point of view of transmission nothing more can be desired. Indeed, the detail figures of the tests prove that losses due to dielectric hysteresis, condenser leakage, corona, radiation and eddies in neighbouring metal are relatively small, which is the more unexpected since the tubular loops were suspended only about 2 ft. 6 in. from the laboratory ceiling, which is a ferro-concrete construction with heavy steel joists parallel to and across the loops. Provided, therefore, that the clearance between the conductors and the top of a vehicle is large, compared with the distance between primary and secondary, troubles due to eddies in the vehicle ironwork are unlikely.

* Elec. Rev., September 15th, 1922, pp. 361 and 393.

The second question is more difficult to answer. A constant current supply is desirable, and all the tests indicate that this condition is very favourable to the Poulsen arc. It conduces to steadiness in working, but the field-magnet exciting current should increase as the voltage rises, so probably this circuit will be best arranged as a shunt from the direct-current supply; usually it is in series in the main circuit. The overall efficiency of the arc, plus transmission, was not very good, and in the tests referred to did not exceed 27.6 per cent., not hopelessly low, considering that the system includes conversion and transformation, and that the maximum power delivered was only about 1.3 kW; but the remedy is evident from the tests. In Col. 5 of Table I the quantity H is the number of watts carried away by the cooling water. It represents by far the largest loss in the system, and takes place in the arc; but this is not all, as the heat carried away by the water is not the whole of the energy that escapes as heat from the arc. Radiation, conduction, and convection account for a loss not included in H. To arrive at an estimate of the total loss from the arc, tests were made of the ratio of the heat absorbed by the water to the total heat generated in the arc when worked with no oscillatory circuit. The average value of this ratio, in 12 tests, was 0.69. Thus the figure in Column 5 is only 70 per cent. of the total heat loss in the arc.

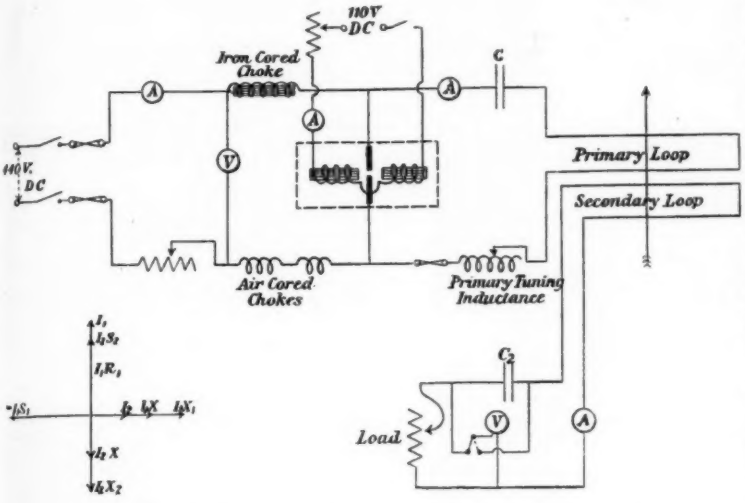


Fig. 1.—Vector Diagram of Resonant Circuits.

Fig. 2.—Arrangement of Elwell-Poulsen Arc Circuit.

Now equations (1) and (2) give a very simple expression for the arc efficiency. Let us assume (since it is very nearly true) that the resistance losses in the overhead tubes are small. Then R_1 is the equivalent resistance of the arc, and R_2 that of the load, and the maximum possible efficiency is given by $\eta = I_2^2 R_2 / V I_1 = X^2/(R_1 R_2 + X^2)$. Taking the first line of the table, $X=2$, $R_2=1.37$, $R_1=7$; therefore $\eta=0.294=29.4$ per cent. The actual copper losses in the tubes were, in this instance, 136 watts, or approximately 3.25 per cent. of the input. Thus the overall efficiency would be 26.15 per cent., as against 24.5 per cent. measured, the difference of 1.65 per cent. being due to stray losses. Now the equivalent resistance of the arc, R_a, is not constant; it rises slowly as V/I_1 increases. This is exemplified in Table II, which is worked out from the same test at 19,700 cycles.

TABLE II.

V/I_1	...	6.5	6.95	7.05	7.6	8.1	8.6
R_a ohms	...	6.5	6.65	6.6	6.85	6.92	7.14

The rise in R_a is not quite regular, because so much depends upon the adjustment of the arc and its field current; but the tendency is clear, and is confirmed by every test. To raise the arc efficiency, therefore, all that is necessary is to increase X in comparison with R_1 R_2, either by raising the frequency, or by increasing the coefficient of mutual induction. Therefore, the overall efficiency should rise with the frequency; this is proved by the tests, for at $f=19{,}700$ it is 24.5 per cent., and for $f=67{,}500$ it becomes 27.5 per cent. Suppose that instead of a single secondary loop we use two turns; then, for $f=19{,}700$, $X=4$ and $\eta=62.5$ per cent., instead of 29.4 per cent.

It is clear, therefore, that as regards efficiency the arc can be made satisfactory. As regards reliability, much experience has already been gained in connection with the large radio installations. Arcs have been built for an output of 1,000 kW satisfactorily, so that the position is distinctly hopeful. On the other hand, Le Blanc claimed a very high efficiency for his ionic generator, and it is possible that this type might be more suitable, although so far no tests have been published.

The third question concerns the possibility of making use of high-frequency currents for driving traction motors, and it was thought that it might be possible to develop a series type of motor fed with high-frequency current direct. However, an analysis of the conditions showed the hopelessness of this plan, and experiments were put in hand to ascertain whether a mercury arc would rectify at high frequencies. For this purpose, an ordinary single-phase glass-bulb mercury rectifier was connected with its anodes across a secondary wound around the tuning inductance. The cathode was joined to the mid point of these turns through a load and moving-coil ammeter. Preliminary experiments had already shown that the bulb rectified satisfactorily from 30 up to 1,000 p.p.s. By the arrangement described, the frequency could be raised to 107,000 p.p.s. and the rectifier was found to operate up to this extreme limit. The only trouble experienced so far is in connection with the maintenance of the arc, due not so much to the rectifier as to the generator, which is always somewhat irregular in its working. Any variation is very liable to extinguish both rectifier and generator, and though the latter automatically restarts, it was not easy to restart the rectifier bulb by a tapping from the high-frequency circuit to the starting anode. In the end it appeared to be more satisfactory to maintain the bulb in operation by means of a small constant maintaining current fed to the starting anode. Difficulties like these have been experienced and overcome in the case of ordinary frequencies, and there is no reason to suppose that they cannot be similarly surmounted when the frequency is a thousand times greater.

It is hardly too much to conclude, therefore, that the system proposed, although at present undeveloped and crude, can be made into an efficient commercial arrangement for the purposes of electric traction, if the absence of a rubbing contact and the simple control of mechanism on the vehicle are advantages sufficient to make it worth while.

Acknowledgments are due to Messrs. H. S. Turton, D. Sayers, and C. J. Garrard, who carried out most of the experiments; to the Department of Scientific and Industrial Research, which gave maintenance grants to some of the workers; to the Royal Society, for a contribution towards the cost of the arc; and to the Muntz Metal Company, Limited, which loaned the copper tubes.

The Volta Effect.

By Prof. ALFRED W. PORTER, D.Sc., F.R.S.

(Abstract of Presidential Address to Section A.—Mathematical and Physical Sciences.)

Towards the end of the eighteenth century Volta observed, with the aid of a condensing electroscope, that a copper rod in contact with a zinc rod assumed a relatively negative potential. His explanation was that there existed in metals an inherent power of separating the two electricities. An alternative explanation made the effect depend upon the accidental circumstance that the metal rods were in air, and that there was incipient or potential chemical action, between the air (or moisture in it) and the rods which created a drop of potential (of different amounts) between the air and each rod; consequently when the rods were brought together their potentials being equalised by a flow of electricity between them, there was still a difference of potential between them and the air. The two theories are known as the contact theory and the chemical theory.

The subject from the beginning proved to be a very controversial one. The time was not ripe in Volta's days properly to discuss it. In its modern form discussion may be said to have begun soon after the acceptance of the two principles of thermodynamics in 1850. The principle of energy and that of entropy put an entirely new complexion upon it.

Early in the nineteenth century a second mode of obtaining a flow of electricity was discovered by Seebeck, which depended on creating differences of temperature in a circuit of two metals. This was the discovery of the thermoelectric circuit. It was inevitable that the two discoveries should become associated with one another, for the thermoelectric electromotive force might be simply due to the temperature variations of the other. The Seebeck effect is very small. A hundred degrees difference of temperature provides an e.m.f. of the order of millivolts at most, while the Volta effect for copper and zinc is of the order of one volt. Whether the two phenomena are intimately related or otherwise, the author considers it necessary to discuss them both, and does so.

He then proceeds to consider the matter on the basis of the electronic theory, which placed the subject on a new footing. The bodily nature of electricity came to be a real thing in the years succeeding 1895. Negative electricity was isolated as electrons, while positive electricity has not yet been separated from the rest of the atom, and may consist of all of the atom which is not electrons. There is now no difficulty in thinking of electricity as a receptacle of energy which may be communicated to it in the form of heat; that is, it has come within the thermodynamical scheme. The question is, which is the best picture that can be given of its position in that scheme?

When an electric current passes across a junction between two metals, say copper and zinc, it is quite certain that no detectable amount of metal is carried by it across the junction. The only things that pass are the electrons which are responsible for conveying the current in each metal. These are tolerably free to move under the influence of an electric force. [They are not set free by the force, for otherwise Ohm's Law would not hold good.] The copper or zinc serves merely as a framework through which their motion occurs. The electrons can get across a boundary between the metals, but the fact that heat changes occur thereat is evidence that they may need to be helped over—there is a rise (or drop) of potential there, though not of an amount equal to the heat entry. It is convenient to think of this potential, V, as a pressure rising from electrical forces, or more strictly, since V refers to unit charge, a pressure divided by the charge on the electron.

It is clear that thermodynamically we may regard the metal as a solution or binary system, the electrons being the solute. The boundary between the zinc and copper acts as a semi-permeable membrane, since the electrons, and nothing else, can get through it. FitzGerald spoke of the free surface of a solution as the most perfect semi-permeable membrane, but the boundary surface between two metals in regard to electrons runs it very close. There is a difference of pressure (or potential) between the two sides. This is an osmotic pressure. The electrons can also escape to some extent from the sides of the wire; they have a vapour pressure. If the temperature is raised this becomes very conspicuous as thermionic emission. The copper also has a vapour pressure, but much smaller. We have then to deal with a volatile solute dissolved in a practically involatile solvent—at least at moderate temperatures.

This being so, and thermodynamics being superior to the idiosyncrasies of individual mechanisms, we can at once transfer all that we know about the thermodynamics of solutions to the thermoelectric circuit. The author treats the subject from this point of view, indicating where further investigation is necessary, and also deals with voltaic cells, concluding that it is still necessary to be cautious and to avoid dogmatism on this question. Much more detailed experimental knowledge is required before the electric circuit is really understood. The electronic theory in metals still has its difficulties, which it is useless to ignore. It is only by recognising the difficulties that advance is made. On the other hand, the experimental difficulties in connection with the direct measurement of the Volta effect are also very great, as all who have made experiments on it must know.

The Education of the Engineer.

Joint Discussion between Sections G. and L.

On September 5th there was a joint discussion between Sections G (Engineering) and L (Education) on the subject of "School, University and Practical Training in the Education of the Engineer." Dr. Cyril Norwood (president of Section L) took the chair, and the discussion was opened by Sir William Ellis (president of Section G).

Sir WILLIAM ELLIS said that there were many boys who at 16 years of age had not made up their minds what career to adopt in life, and in taking up engineering after leaving school they would probably have to devote any further educational opportunities to dealing with subjects directly relating to engineering. This might prevent them getting any further general education, which would place them at a disadvantage in later life compared with those who had gone further in their general education in their schooldays. There was a tendency in the medical profession for a boy to specialise to the extent of training for the first M.B. whilst at school, and if this could be done without encroaching on the opportunity of going farther in general education, could not the same method be adopted in engineering? The next point was whether the practical training in engineering should immediately follow the school course or whether it would be best to take it after the university course. Sir William thought that the workmen were more willing to give advice and encouragement to a boy than to a young man who had completed his university course. The "sandwich" system was working reasonably satisfactorily in places where there were several pupils. Although four years at a university was to be preferred, the three-year courses being arranged by the universities did not place the same financial strain upon parents. It was suggested that the first two years should be carried out on the usual lines, but in the third year the student should be given the option of taking his honours course in one or other of the branches of engineering rather than imposing on him a high level of engineering knowledge as a whole.

Col. IVOR CURTIS considered that the fundamental problem was how to secure the three essentials—workshop training, technical education, and general self-development—during the pre-university stage without the sacrifice of any one of the three to another. He thought that the Air Force system of training achieved this object. This scheme provided for taking well-educated boys between the ages of 15 and 17 years, and giving them practical training with only eight hours' technical education per week. In this way 7,000 boys had been dealt with; 4,000 had been pased out into the Service and 3,000 were in training. The boys had to pass certain tests in handicraft as well as knowledge, and the number that failed was very small. The technical knowledge had been found to be of a higher standard than was originally expected. By this scheme it was claimed that the three essentials which the speaker had outlined could be obtained during the ages of 16 and 20, whilst the more able boys would be ready to proceed direct to a course of university standard. When engineering first sought help from the universities, it needed most the design engineer and the research worker. To-day, it needed help no less in the training of the practical-minded man for production and management. Could not the universities modify their long-established practice and outlook to meet this new demand and the needs of these practical minded men? The speaker recommended the formation of local advisory councils consisting of representatives of the management, the worker, the school or education authority, the teacher, the parent and the boy, and from these he foreshadowed the evolution of a national advisory council.

Sir JAMES HENDERSON said that the school or university could never teach a student those qualities which came only by judgment and experience, and no combination of school and university education could turn out an engineer according to the definition of the Charter of the Institution of Civil Engineers. Any claims which gave this impression should be avoided, and it was from this point of view that the degrees of bachelor and master of engineering, granted by some of the newer universities, were to be deprecated. The terms B.Sc. or M.Sc. as adopted in the older universities were to be preferred. The word "engineer" was greatly misused and a combination of the various professional institutions to stop this misuse was necessary.

Prof. A. L. MELLANBY expressed the view that the higher university technical courses were only suitable for those whose duties would lie in the direction of design and research and they were a relatively small proportion of the whole of engineering students. He suggested that beginners' courses in engineering should be free from the so-called preliminary work in science, and a descriptive and explanatory form of engineering should take its place. There should be a system of graded scholarships which would ensure that youths of promise could be passed on to the higher schools and universities without delay, and there should also be a national system of apprenticeship combining works education with class training, and in conjunction with this there should be a scheme for ensuring that the higher appointments in engineering were only filled by the truly qualified. This question of the higher qualifications for the more important posts was a matter for the engineering institutions rather than the educational institutions.

Sir HENRY FOWLER expressed regret that there were not more industrialists present, and added that there was much he could criticise in the Air Force scheme, which must only be regarded as an experiment. Whilst appreciating the advantages of the scheme, it could not be said to be an industrial training, and there was no doubt that a boy received the greatest possible education from the administrative point of view when working side by side in an industrial shop with the men there. His own idea of engineering education was to take a boy from the public school when he had not specialised too much on any one subject and place him in a shop for 12 months, during which time he should attend part-time classes. Then he should go to the university for three years and during vacations go back to the shop. Finally, he should have two years in the shops. The most important thing, however, was to strengthen character.

Dr. W. W. VAUGHAN (Headmaster of Rugby) said that the difficulty was that educationalists knew little of what was being done in the shops and industrialists knew little of what was being done in the schools. Something like 50 per cent. of the boys in public schools to-day expressed a preference for engineering, but it would be absurd to suggest that all of them should be trained for the higher positions. The ideal, in his opinion, would be for a boy to leave school at 17 or 18 years of age, go for a year to a works and then pass on to the university.

Mr. A. LENNOX STANTON said that, in his opinion, an engineer was one who combined maximum efficiency with minimum waste. One of the things most lacking to-day was the ability to pay attention to detail and it was there that the American trained engineer had the advantage over the English trained engineer.

Prof. W. KERR said there was now a new demand for development in engineering teaching which seemed to entail what might be termed educational research. Certain it was that a need existed for a separate training of those who had been referred to as possessing scholarly minds and those with practical minds, and he hoped that when the new schemes were devised it would be found that they avoided what he regarded as the overloaded nature of the engineering curricula.

Dr. J. GRAHAM said that in Leeds it had been found that the best return was received from the boy who went from the secondary school at about 16 years of age into the engineering shops, although it would be all the better if he stayed another year at the secondary school. These boys went into the shops for three years or four years, meanwhile attending technical schools at night—when they were too tired to get the full advantage. Here again engineers themselves required educating. At the end of the workshop period, the records of the boys were examined, and if satisfactory the boys were granted a university scholarship for three years. During the time he had been at Leeds, 120 of these boys had thus been trained, but the difficulty was that when they went back to the works they had been in and asked what could be done for them, more often than not they were told they could go back to their old machine at the old wages. The result was that most of these men had gone abroad and were filling important posts.

The 1928-29 Lighting Season.

Manufacturers' Advertising Schemes.

IN our last issue we made brief reference to the lamp propaganda which is being conducted by some of the leading manufacturers, including the GENERAL ELECTRIC CO., LTD. As we stated, the remarkable feature of this company's campaign is the adoption of five "Pearl Osram" lamps to take the place of 65 other patterns, which is a unique effort at standardisation and simplification. The company directs its attention to the conversion of retailers to its point of view, stressing the benefits which will accrue to them and urging them to convince customers of the soundness of the scheme. In a brochure addressed to the trade a list of the replaced lamps is given, and it appears certain that for all ordinary applications "they never would be missed," although a good deal of conservatism has to be overcome before this is generally accepted. As the brochure says to the retailer "You're going to meet opposition, you are going to face the sceptics. But you have a sound proposition, a better lamp in every way, and you cannot fail to confound the opposition and convince the sceptics." It appears to be the intention to abandon gradually and eventually the clear gasfilled lamp and the externally frosted and "white" types. In the meantime, of course, these patterns will still be available for those who want them.

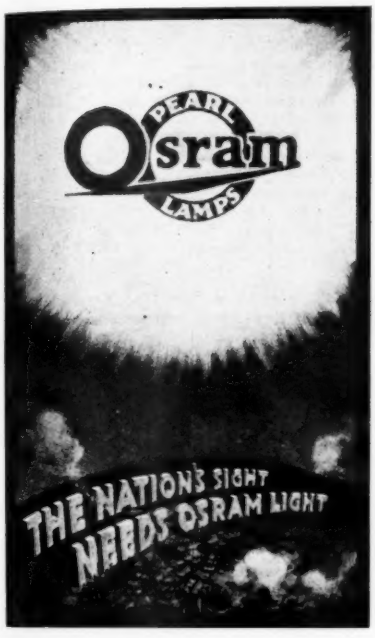


Fig. 1.—An "Osram" Design.

Fig. 2.—A "Pearl Osram" Window Display.

Among the designs which are being employed by the G.E.C. is the one reproduced in fig. 1. Except for the "Osram," which is in red, subdued tints and shades are used, and the result is very pleasing. The five lamps which form the "Pearl Osram" range are used in the window display which

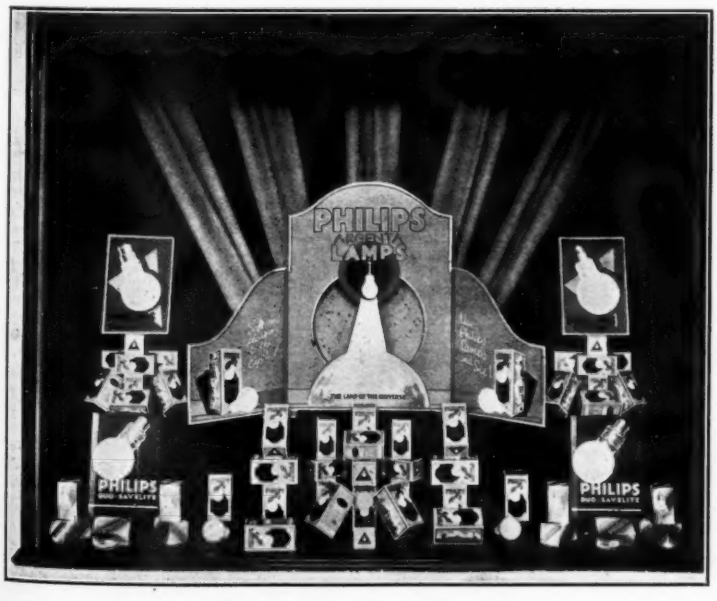


Fig. 3.—The Philips Window Display.

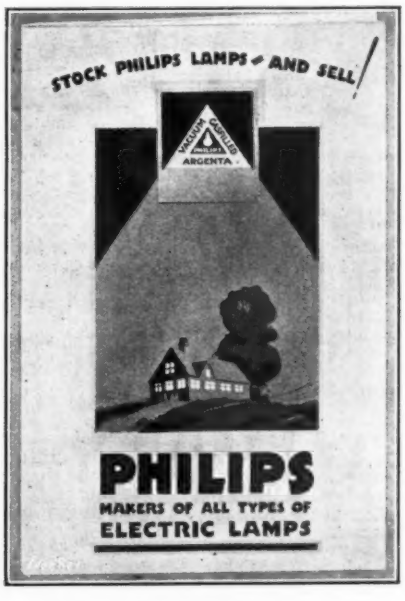


Fig. 4.—A Philips Design.

is illustrated in fig. 2. This is a very simple arrangement, but none the less effective on this account. In addition to these direct aids for the retailer, the G.E.C. is doing a great deal of advertising in national newspapers and periodicals, special attention being paid to the trade journals.

PHILIPS LAMPS, LTD., is also using the Press very freely during the coming season, including the specialist papers, and has produced a number of pamphlets, showcards, posters, &c., to help retailers of "Argenta" lamps. One of the designs which the company is using is illustrated in fig. 4. It is in two shades of blue and white, with a superimposed label bearing the company's name and trade mark. Special care has been devoted to the design and colour of a special window display, which is depicted in fig. 3. The central screen is 4 ft. 6 in. wide and about 3 ft. high, and can therefore be used in practically any window. The company is employing a large staff of window dressers, who will be at the disposal of any trader who is prepared to devote his window for a period to a Philips display. The whole of the necessary material will be provided by the company, thus relieving the retailer of a great deal of trouble and worry.

Another company from whom a collection of publicity matter has been received is CRYSELCO, LTD.; this deals with the com-

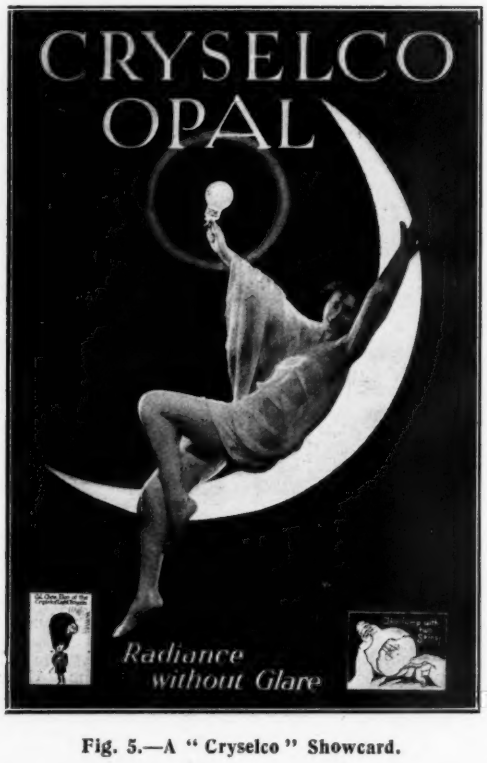


Fig. 5.—A "Cryselco" Showcard.

pany's pearl, opal, automobile and general lamps. We reproduce a large showcard in black and white, "Radiance without Glare," which is one of the attractive designs included in the campaign matter. "Colonel Chris. Elco" also appears prominently in the pamphlets, showcards, &c., and he is the central figure in a cardboard cut-out which is being distributed to the trade. The familiar "lamp with two skins" (opal type) is also given a place. An interesting booklet entitled "Night Lights" is another feature of the "Cryselco" propaganda. This bears a picture of Piccadilly Circus on its cover and forms a useful treatise on domestic lighting.

Conditions in Austria.

Commercial Secretary's Report.

THE British Commercial Secretary at Vienna (Mr. O. S. Phillpotts, O.B.E.), has furnished a brief report upon the financial and commercial situation in Austria, up to the end of July, to the Department of Overseas Trade. Mr. Phillpotts says that the last twelve months has been the most prosperous period in the history of the new Austria. In the summer of 1926 the lowest point of depression was reached and since then there has been a fairly regular and substantial improvement in general business conditions, although there has been nothing in the nature of a boom. Austria is by its nature dependent upon foreign trade and finance and the recent improvement has been largely coincident with a condition of greater economic activity in Central Europe. Of late this activity has fallen off, but although Austria will be affected no new depression is anticipated.

The condition of the public finances continues to be favourable and of late the tendency has been towards reduced taxation. The capital expenditure of the State, which is restricted to works calculated to bring in a direct return, has of late been devoted chiefly to the electrification of the railways and the extension of the telephone cable system. The issue of a new State loan has been delayed by the failure of the United States Congress to pass the necessary Bill before its recess. The Municipality of Vienna, however, raised a foreign loan of $30,000,000 at the end of 1927; this is being spent on the improvement of services such as tramways, electricity and gas.

In the first seven months of the current year most branches of manufacture, with the exception of cotton spinning, made a further advance upon the improvement of 1927. Among the industries which are working at full capacity is the "low-tension" industry, which is benefiting from the conversion of the Vienna telephone system to automatic working, and from the extension of long-distance telephone cables. The "high-tension" works are busy with the electrification of the railways and with water-power exploitation, not only in Austria but also in Russia and the Succession States. The locomotive and wagon works have received large orders from the State Railways and the municipal tramways. The new radio industry is also flourishing. A bad feature of Austrian economic life is the lack of improvement in unemployment and insolvencies, but these are of a rather special character. The expansion of industry is insufficient to absorb the increased numbers on the labour market, while with regard to insolvencies there is an urgent necessity for a Bill dealing with some of the worst defects of the law concerning judicial compositions.

The development of Austria's foreign trade has not been nearly so rapid as the recovery in production and internal economy generally. Nevertheless, here, too, an improvement has taken place since 1926. The turnover has increased and the balance of imports over exports has diminished. Although the trade of the neighbouring Succession States—Czecho-Slovakia, Hungary, and Jugo-Slavia—is still very important to Austria, their share in Austrian commerce continues to shrink. Germany has now become Austria's largest customer and the proportion of Austrian trade with Western Europe and overseas countries has also risen of late. This redistribution of Austrian trade is benefiting the United Kingdom. As the Austrians have to pay the same duty on, say, Bohemian goods (which before the war came in free but now being Czecho-Slovak are foreign) as on British goods, they tend to buy more of the latter, generally on account of the high reputation of British quality. The total value of British exports to Austria has more than doubled during the last six years, and their proportion to the total value of Austrian imports has risen from 2.4 per cent. in 1922 to 4.2 per cent. in 1927. Austrian exports to the United Kingdom have been higher in 1927 and 1928 than in previous years. Among the items which showed increases were lamps and radio apparatus (mainly valves). Austria's imports of the latter in 1927 amounted to 32 metric tons, mainly from Germany; the United Kingdom supplied 4 metric tons.

It is considered that the economic recovery of Austria involves openings for trade. Many other symptoms of greater prosperity could be quoted, such as the steady rise in railway goods traffic, in the consumption of coal and electricity, and in the savings bank deposits. Improved trade with the Succession States and the Balkans is hoped for. Austrian trade with these countries is largely in foreign goods; a considerable part of these is British, and if merchants and manufacturers in the United Kingdom paid the same attention to the Austrian market as the Germans give to it, their share might be much greater.

An Automatic Control System.

An electrical and automatic system of motor traffic control has recently been introduced by Messrs. Switchgear & Cowans, Ltd., by whom it was demonstrated last week at their works in Manchester. The system, an invention of Mr. J. E. Waller, chairman of the company, employs a lamp post erected at the junction of an inferior road with a main road and equipped with red and green lamps so arranged that normally a red light (danger) is shown to the side road traffic, and green lights (caution) to the main road traffic. When a vehicle in the side road is approaching the junction the red light changes to green and the green lights to red. These operations are effected by the vehicle on the side road depressing a road-plate, at a convenient distance from the junction, normally held by springs slightly above the road surface. By means of a rod and crank mechanism the depression of the road plate operates a switch in a box in the footpath, which, through a solenoid arrangement, operates the lamps. The solenoid is only momentarily energised, but the return of the core to its original position is retarded by means of a time-lag, so that the lamps are not switched back again until after a predetermined time. As an additional warning a siren or gong can be attached to the lamp post and electrically operated at the same time as the visual signals. If it is not desired to have the lights "on" under normal conditions, a switch can be provided to cut out the lights except when a vehicle on the side road is approaching the junction. In order to prevent the signals operating unnecessarily as the result of a vehicle travelling in the opposite direction, an isolating plate is used. This is placed nearer the junction than the operating plate and is arranged to break the circuit for a sufficient time to prevent the passage of the car over the second (operating) plate.

The Machine Tool Exhibition.

Some of the electrical features of the exhibits at the Fourth Machine Tool and Engineering Exhibition at Olympia.

(*Continued from page* 418.)

On the stand of the BRITANNIA LATHE & OIL ENGINE CO., LTD., is an F.1 type electrically driven lathe which incorporates the driving motor in its leg at the tailstock end, fig. 7. This arrangement has a very neat appearance and enables the switch to be so placed as to be within easy reach of the operator. There is, however, a clutch fitted between the motor and gearing so that the lathe can be stopped by the operator's knee. This clutch, while not altogether essential, is

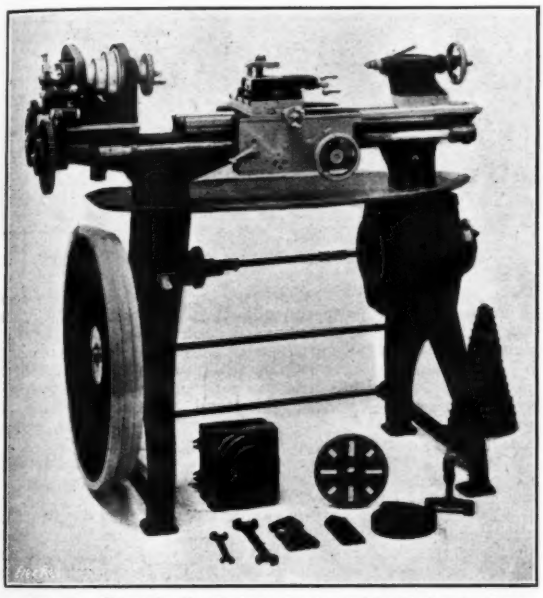


Fig. 7.—Electrically Driven Lathe with Motor in Leg.

very useful because it saves time in stopping and starting the lathe, and, further, should the operator require to employ a gauge or micrometer, he is able to use the clutch with the knee and utilise both hands on the work. Two universal joints are used to couple the motor to the gearing, and these obviate difficulties as regards alignability. The motor is almost totally enclosed, and, it being placed at the tailstock end, the risk of dirt or chips entering it is eliminated.

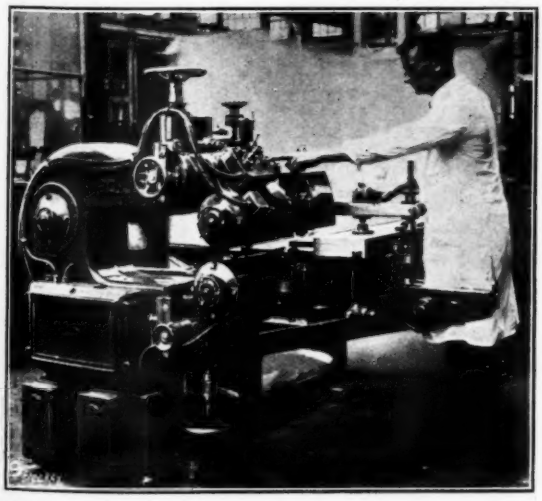


Fig. 8.—Tenoning Machine with Five "Built-in" Motors.

Very interesting developments have taken place recently in connection with the electric driving of wood-working machinery, and some excellent examples of the clever designing necessary for embodying the driving motors in the construction of some of the more complicated machines are to be seen at the exhibition. Fig. 8 shows an electrically driven tenoning machine which is being exhibited by Messrs. WADKIN AND CO. It is a completely self-contained machine with a built-in motor to each cutter head. It is suitable for a.c. supply at 40 or 50 cycles, 2 or 3-phase. The machine is of the swan-neck type and is therefore suitable for cross-cutting, trenching, housing, and so on, in addition to the various tenoning operations. It will take timber up to 24 in. wide and will cut tenons 6 in. long, grooves 4½ in. wide and cross-cuts 4½ in. deep. The motors all run in ball bearings. Independent push-button control is provided for each motor, and a master push-button serves to stop all the motors. All the control gear is totally enclosed. Two vertical motors drive tenon cutters, two similar ones are installed for scribing, while the fifth motor, a horizontal one, drives the cut-off saw. All except the top scriber motor, which is of 1 h.p., are 2-h.p. machines. Each motor is fan cooled and well ventilated.

Messrs. EDWARD G. HERBERT, LTD., are showing three metal-sawing machines and one saw-sharpening machine driven by individual electric motors. A novel feature claimed for the metal-sawing machines is that the electric drive is simplified by building the speed-reducing gear into the machine and allowing a standard motor to be used. As the motor has not to be built into the machine, customers can utilise the type of motor they have adopted generally in their works.

As already indicated, there are very few purely electrical exhibitors at Olympia, but the place for electrical equipment at a show of this sort is with the machines, performing driving and controlling duties. Messrs. BROOKHIRST SWITCHGEAR, LTD., have arranged with prominent exponents of electrically

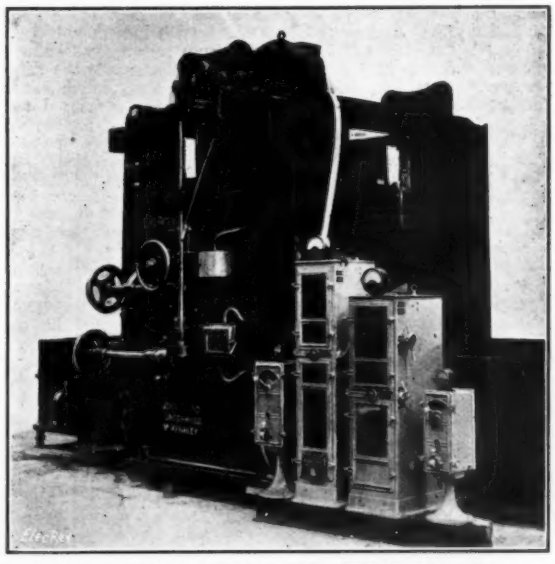


Fig. 9.—Control Gear for Large Grinding Machine.

driven machines to employ Brookhirst equipment in connection with their own exhibits. Nearly 100 of such control gears are to be seen distributed over 19 different stands. Amongst them practically every form of control is represented, from the simplest hand-operated starter to the automatic control panel with full protective features, dynamic braking, and so on. A particularly interesting and valuable feature, and one that should be noted by other electrical firms, is that a Brookhirst engineer is in attendance at the exhibition, and, by permission of the machine-tool makers, will demonstrate the control gear to interested visitors.

An example of Brookhirst switchgear in operation at the exhibition is shown in fig. 9 in connection with a large grinding machine on the stand of Messrs. JOHN LUND & CO., LTD. The machine is fitted with four motors. The main motor, which drives the grinding spindle, is controlled by a standard drum-type starting panel. The second motor drives the cross traverse head, and the controller for this motor is an automatic starter fitted with reversing contactors. The machine is fitted with tappets operating a limit switch at either end of the cross traverse, to control the to and fro motion of the motor, after it has been started up by means of either the "forward" or "reverse" push buttons. The above drive can also be changed over to raise or lower the head for adjusting the work. The controller is so arranged as to keep down the armature peaks at starting to a minimum. Another feature of the controller scheme is that the motor always comes to

rest before current is applied in the reverse direction, thus preventing excess voltage being applied to the motor. The third motor drives the table traverse and is controlled by a "small power" faceplate-type starter. The fourth panel controls the lubricating-pump motor. The total power supplied by the four motors is 57 h.p.

Interesting innovations being exhibited by Messrs. CAMBRIDGE INSTRUMENT CO., LTD., are two surface pyrometers designed for measuring the temperatures of small metal billets. The instrument shown in fig. 10 utilises the Cambridge strip form of thermo-couple, the strip being made in the form of a small elongated loop which is protected by a four-sided metal case with a wedge-shaped opening at the extremity. Two of

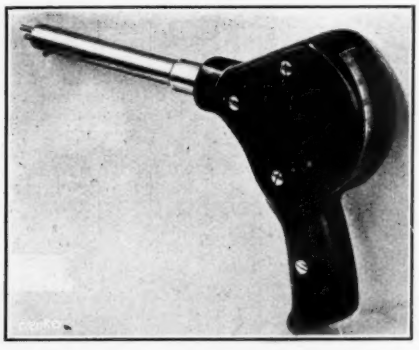


Fig. 10.—Surface Pyrometer for Metal Billets.

the edges of the opening project further than the other two, and are of chisel form, so that in applying the instrument to a billet any slight scale may be first scraped off before the thermo-couple is pressed into definite contact with the clean surface. The indicator is embodied in the handle of the revolver-shaped instrument, which can be calibrated for practically any temperature between 0 and 800 deg. C. Another exhibit by the Cambridge Co. is a deviation indicator designed to enable deviations of temperature from any desired value to be easily and quickly observed. Instead of showing the actual temperature which is being measured, the instrument is arranged to show the difference between the measured tem-

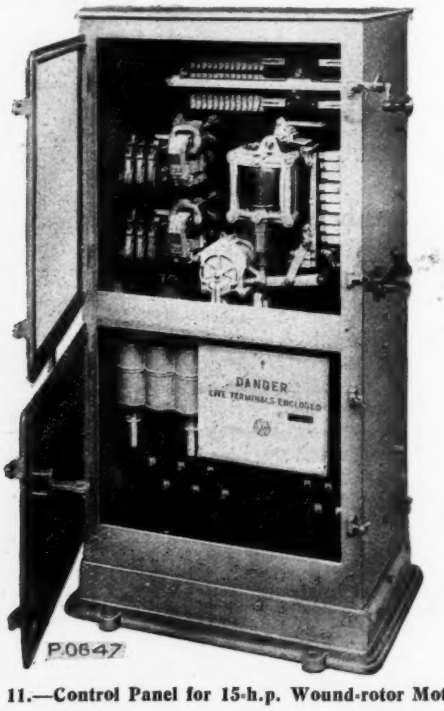


Fig. 11.—Control Panel for 15-h.p. Wound-rotor Motor.

perature and a standard "zero" value which represents the desired temperature for the process under observation. The indicator dial is marked in large and clear graduations from −25 deg. C. through zero to +25 deg. C. The deviation is also indicated approximately by means of green, white, and red lamps mounted on the top of the instrument; these are automatically illuminated as the pointer moves along the indicator scale. The actual temperature is measured by means of a platinum resistance thermometer, comprising a coil of platinum wire wrapped round a porcelain bobbin. This bobbin, protected by a suitable sheath, is exposed to the temperature being controlled and connected to the indicator by suitable leads. The operation is on the "Wheatstone" bridge principle. The necessary galvanometer is a separate unit which may be mounted some distance away; it can be arranged to operate a number of separate indicators. A standard thread recorder can be added to the outfit, the resistance thermometer for this being mounted together with the indicating thermometer within a single perfecting sheath.

Some interesting control equipment is being shown by Messrs. WATFORD ELECTRIC & MANUFACTURING CO., LTD. A feature of this exhibit is a novel type of contact on the contactors, the Watford "three-point lock," which obviates arcing due to chatter on closing. Instead of the usual compression springs, a butt-and-brush contact which locks about a fulcrum spindle is employed. The a.c. contactors are fitted with a special silencing device to eliminate "humming," and this is materially aided by a toggle movement on the larger sizes. Another item of interest on this stand is a large wheel-lathe control panel for push-button operation, including inching, starting and stopping, and speed control. A feature of this equipment is the "slow down" push-button service, by means of which, on wheels with hard spots returned to the works for turning, the lathe can be slowed down rapidly while these spots

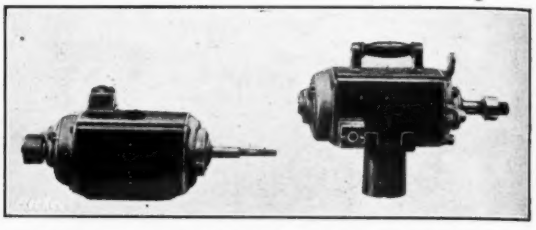


Fig. 12.—Low-Centre Motors for Wood Working.

are passing the tool and quickly re-accelerated when the finger is removed from the special push-button. Among the other items on this stand is an automatic control equipment for ship service for use with a variable-speed d.c. motor. The control is by means of a float switch operating on the rise and fall of liquid in a tank. Fig. 11 shows a recent design of machine-tool control panel on view on this stand. It is intended for use with a 15-h.p., 200-V, a.c. wound-rotor type of motor, and is equipped with an inching and pre-set speed regulator.

MESSRS. BROOK MOTORS, LTD., have a useful and interesting show. Generally, it consists of an assortment of various a.c. motors, single, two, and three-phase, in sizes from 1 h.p. to 30 h.p., along with starters, reduction gear, and parts. The principal part of the exhibit is taken up with interchangeable a.c. to d.c. motors. Whilst it is well known that Messrs. Brook Motors are not manufacturers of d.c. machinery, they have come to an arrangement with a reliable maker of d.c. motors whereby they can offer motors that will be strictly interchangeable, not only in two- and three-phase, but also single-phase, with d.c. motors. It is believed that this is the first time that interchange of single-phase and d.c. motors has been offered. A novel feature on the Brook stand is some specially designed motors, fig. 12, for wood-working machinery. The long and rectangular design of these gives them a very low centre, a very desirable point on wood-working machines. The centre is half that of the ordinary standard machine.

Some interesting electric welding equipment is to be seen at the exhibition. Messrs. C. D. PETERS & CO., LTD., are exhibiting the Wilson plastic arc electric welding plant, and

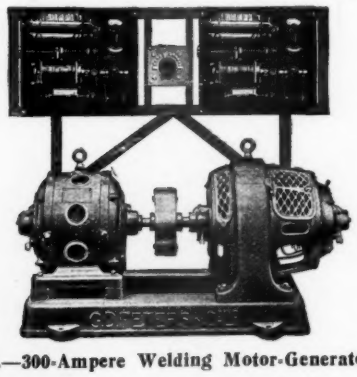


Fig. 13.—300-Ampere Welding Motor-Generator Set.

demonstrations are being given with a two-operator, 300-A motor-generator set, fig. 13, fitted with K.5 automatic current-control panels, which are guaranteed to keep the welding current constant within 5 per cent. The minute adjustment obtainable by the control panel enables, it is claimed, just the correct amount of current to be applied, resulting in a perfect weld at least cost. Amongst other items on view on this stand is a single-operator portable petrol-driven set, having a capacity of from 75 to 200 A. This set is built for rough usage and is particularly suitable for outside work where all varieties of jobs are to be met with under the worst conditions. A special light-weight portable single-arc motor-generator set is also being shown.

(To be concluded.)

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A Wiring-system Box.

The Walsall Hardware Manufacturing Co., Ltd., Hatherton Works, Ablewell Street, Walsall, has recently introduced a new box which is intended for universal use on the "Walsall" metal-sheathed wiring system. With the necessary accessories it can be used as a ceiling rose fitting, cord grip fitting, plug and socket fitting, and so on. Fig. 1 shows it as an ordinary 3-way joint box. It has four ways which may be blanked off

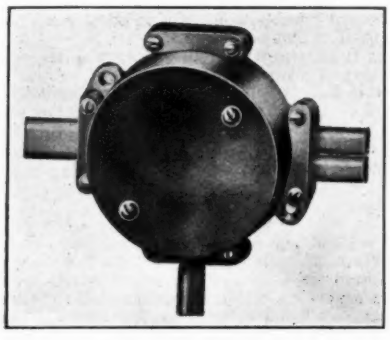


Fig. 1.—"Universal" Wiring-system Box.

by special bridges as required. Any number of metal-sheathed cables up to eight may be used, and of any size from 1/.044 single up to and including 3/.036 three-core. Efficient bonding is provided by means of special clamps, according to the number and sizes of cables used. The box is made to B.E.S.A. requirements. There are no holes in the base of the box, external ears being provided for the fixing. Unless otherwise ordered, all boxes are sent out complete with four bonding clamps and one spare blank as indicated in the illustration, but any arrangement may be supplied.

A New Electric Bell.

Fig. 2 illustrates the "Wigan" polarised a.c. bell, a recent production of Messrs. Heyes & Co., Ltd., Water-Heyes Electrical Works, Wigan, which has been designed for use on alternating current circuits for direct operation at up to and including 500 volts and any periodicity up to and including 50 cycles. The bell is compact and has, it is claimed, a very efficient magnetic circuit; the armature is so designed as to

Fig. 2.—The "Wigan" Bell.

synchronise with the periodicity of the circuit. The current consumption is negligible. It is made in one size only at present, and is fitted with a 5½-in. diameter metal bell gong. As there are no make and break contacts, it forms a most reliable form of audible signal and also dispenses with the use of small inefficient transformers.

New Electric Radiators.

Messrs. Veritys, Ltd., 32, King Street, Covent Garden, W.C., are marketing several new interesting electric fires this year. One is the "Maxlumette" fire, fig. 3, which gives a dispersive beam of heat and is designed to meet the demand for a small fire that can be left on all day and night in bedrooms and small rooms where the one-unit fire is too much. The top is flat, so that foods may be kept warm on it.

Another new model is the "All-the-year-round" fire, fig. 4, which is intended for universal use in offices, shops, works and the home. On the top trivet food can be kept warm; a kettle can be boiled on the centre trivet; and the bottom trivet

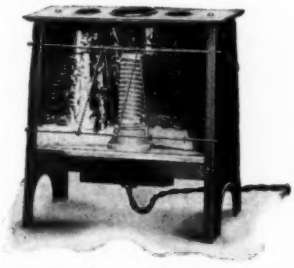


Fig. 3.—The "Maxlumette" Fire.

Fig. 4.—The "All-The-Year-Round" Fire.

is removable and can be used for many purposes. The appearance of the fire when on is very effective. The front heating bar throws the heat into the room; and the top heating bar is reflected in the solid-copper hammered reflector, presenting a cheerful glow.

"Typerlite" Fittings.

A further development of the patent "Typerlite" (described in the Electrical Review of July 8th, 1927, p. 83) is a range of "Typerlite" general utility fittings which are being made by the "Typerlite" Company (owned by Electricity Services, Ltd.), 27, Martin Lane, Cannon Street, E.C.4. These fittings are mainly constructed in three parts, all of which are interchangeable, so that it is possible for anyone without a knowledge of electric wiring or the use of any tools to assemble a variety of attractive electric light fittings in the form of table standards with various bases, clamp-on fittings, wall brackets, industrial-type fittings, and so on. With the aid of a specially designed ratchet junction piece these fittings can be extended or shortened as desired, and moved either vertically or horizontally. The head of the fitting, which consists of a length of metallic flexible tube fitted with a special square nozzle at

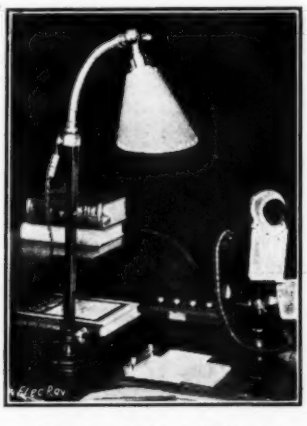


Fig. 5.—Table Standard.

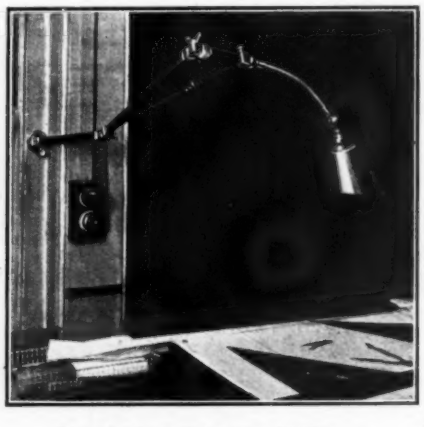


Fig. 6.—Industrial-type Fitting.

one end, and a knuckle joint, lampholder, and special shade at the other, is wired independently of the rest of the fitting, so that it can be detached and adapted for use with any of the fittings. The makers also supply a "Householder's Complete Set" by means of which the consumer is enabled to assemble his own fittings. Included in the set is a 2-way G.E.C. "Bakelite" adaptor which is intended to allow extension from one "point" to any position in the room. The whole of the appliances are manufactured in England and are attractive and of solid construction. Figs. 5 and 6 show, respectively, the "Typerlite" table standard and one of the industrial-type fittings.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

The Autumn Factory Lighting Campaign.

I was very interested in your editorial this week regarding the possibilities and advantages which would accrue to the electrical industry as the result of the Factory and Workshop Lighting Campaign about to be inaugurated.

My experience over a number of years has been that the chief opposition comes from the workers themselves. I have found the managements of works interested and alive to the possibilities of better lighting; the electricians are equally tractable and eager to improve their lighting, but, alas! the workers have adopted a hostile attitude to any alterations effected. All they require is a big light right "on the job"; it does not matter to them that such primitive lighting is likely to be injurious to their sight and is really an impediment to their operations.

Some time ago I installed some modern fittings in a large tinplate works. We obtained an excellent lighting effect—on the working plane—but much to the chagrin of the management and electricians, the men contended that the light was of no use and demanded to have the bare lights reinstated alongside the stacks of tinplates, the men having to sort the plates with the large gasfilled lamps almost blinding them.

I feel, therefore, that the advantages of better lighting should be brought home to the workers as much as to the employers by sending to the works large posters with a request that they be prominently exhibited for the education and benefit of the workpeople in modern lighting.

W. H. Stone.

Cardiff, *September 5th*, 1928.

Forecasting Raw Material Prices.

Your correspondent Mr. E. Doble seems disappointed at not finding in my article a sure formula for forecasting the price of manufactured goods. A reference to the article in question, however, will, I think, show that it was intended to be of assistance in predetermining changes in the price of raw materials and not manufactured articles. This difference, apparently slight, is actually very important, and a study of relevant statistics will show that commodity prices, and in particular metal prices, obey much more closely the laws of supply and demand than do those of manufactured goods.

But apart from any distinction between commodities and articles, it seems rather optimistic to hope for a treatment which will guarantee the results anticipated. The possessor of such a system as Mr. Doble idealises would obviously only need the necessary capital to be able to make a personal fortune of any magnitude. Moreover, if this hypothetical system were put to universal application, any impending fluctuation would be discounted before it occurred, so that prices generally would assume a remarkable stability.

My main object was to indicate a procedure which might prove of assistance to the purchasing department of an electrical manufacturing concern. The alternative to adopting some such system resolves itself into a shot in the dark. If Mr. Doble's criticism should lead anyone to devise and publish an ideal price forecasting system, he will undoubtedly deserve the congratulations of every business man; but in the meantime, is it not shortsighted to despise a system which, if it does not entirely meet with one's approval, nevertheless has been definitely proved to reduce errors due to misjudgment?

A. W. Willsmore.

London, *September 10th*, 1928.

Does it Pay to Acquire Knowledge?

I work on the railway and in the same particular branch as "Ambitious." He complains, yet he has had four promotions in three years—well, he is lucky! I had only one in six years, and I know a good many men who have never had one promotion ever since they worked on the railways, in some cases covering 14 or 15 years, and have no hope for anything either, having given their *best years* in service to the particular company they work for, without anything to look forward to at the end for services rendered, unless the chiefs turn philanthropic, which is extremely doubtful. They are keen men, and capable.

The fact is, the man in the sub-station has very little opportunity or scope to exercise and show his ability; also, his work is less conspicuous than that of the technical staff, whose actions are more noticeable, because they are next door to the office.

Another fact is that no qualifications are asked for by the companies where sub-station men are concerned, in these days, except perhaps some experience; in a good many cases, the railways promote the lower grades in the electrical department, to sub-station attendants; irrespective of whether a man is A.M.I.E.E. or X.Y.Z., he is on a level with the (late) something or other, who in most cases possesses neither technical, theoretical, nor practical knowledge, and in fact does not bother about them, whilst he can utilise the brains of the trained man. The trouble with "Ambitious" is that he is not ambitious; otherwise he would not keep in the particular branch he is working in, which only proves that the possession of the qualification A.M.I.E.E. is not of much use where there is lack of initiative.

The qualification of various examinations does not mean, in some cases, the power to put the knowledge into practice. I have met some queer "Degree" men in my time, and one wonders how they pass examinations and forget them immediately afterwards.

We have other A.M.I.E.E.'s and B.Sc.'s in our sub-stations on the railways, and though not one myself, I am all the more grateful for a promotion, which I endeavour to earn by paying attention to my work and being studious.

Rifleman.

London, *September 8th*, 1928.

The troubles of "Ambitious" and "Interested" have frequently been ventilated, but we seldom hear of the employer's difficulty when he seeks a competent man for certain work. He usually advertises or answers advertisements, but the replies tell him so little and in such poor verbiage that all the applicants appear equally wonderful in their attainments and equally ignorant of English.

Any young man who wishes to rise should frequently practise the writing of an interesting letter, and he will soon find use for his skill therein, either in securing recognition from his present chief or in escaping from hopeless surroundings, remembering always that most employers are keenly anxious to find ability amongst their own employés or elsewhere.

London, *August 24th*, 1928. **A Retired Employer.**

Electrical Slogans.

Mr. Turnbull's article on "Electrical Slogans" in your current issue is extremely interesting, and he has dealt with the matter admirably in such small space. I must, however, disillusion him regarding his suggested slogan: "Electricity—Your Servant," it being unfortunately a copy of "Gas—Your Servant," a slogan used by at least one gas company in my supply area, and emanating, I feel sure, from the B.C.G.A. As Mr. Turnbull remarks, a slogan looks so simple that we all wonder why we never thought of it. Several years ago I used the slogan "Electricity—The Ideal Servant," usually with a follow-up of "Ever on duty at a touch of the switch"; some twelve months ago the largest gas company in my area commenced to use "Gas—Your Servant," which is infinitely more snappy. We are at a great disadvantage with the word "Electricity" for slogan building; on the other hand, I am not quite in agreement with the suggestion of one of your contemporaries to coin a new word to replace "electricity." I do think, however, that a snappy slogan will one day be devised that need not include the word "electricity"—for example: "Worth a guinea a box," "Every picture tells a story," and many other sentences or slogans tell us instantly to what they refer, surely a triumph of intensive national advertising. I hope E.D.A. will soon obtain a suitable slogan and stick to it and advertise it well and often. If every manufacturer, contractor, and supply authority used this slogan in all their advertisements it would soon be well known.

The Robot idea is very sound and has been locally adopted by the North Met. Company, whilst we all know "Mr. Hotpoint"; here again, however, if adopted let it be under E.D.A.'s wing and make a nation-wide stunt backed up by local advertising. I hope we shall have more articles and correspondence on this interesting subject in future issues.

Boston, Lincs., *September 9th*, 1928. **H. Payn.**

Regulations for Overhead Lines.

I have been interested in Messrs. Ekström's article on "Regulations for Overhead Lines," comparing the British with those of other countries.

Section I—Leakage of Current—in your issue of August 31st is open to very considerable objection because the authors have confused high- and low-pressure British regulations, drawing deductions from the low-pressure regulations when they apply to high-pressure, and *vice versa*. This is a pity, because the rest of the article is excellent. British regulations are not perfect on the subject of earthing pole ironwork, and, to a lesser extent, on the provision of earthed wires, but they are not nearly so bad as the article would indicate. These matters were dealt with effectively in the recommendations of the Overhead Lines Association, published in your journal in the spring, and those of your readers who are interested in this subject should refer to them.

Messrs. Ekström, in common with many engineers, have quite a wrong idea of the use of the earth wire on high-pressure lines. This is not provided to catch falling wires but to provide multiple earthing for pole ironwork, and it is a very good system! This wire also protects the line to a considerable extent from atmospheric disturbances by keeping down the air potential locally.

Messrs. Ekström do not refer to bird guards, but their use provides a cure for the evil which they indicate. A careful choice of the position of an insulator in relation to the pole ironwork and the provision of long spindles may in some cases reduce the bird nuisance to a vanishing minimum.

With regard to the suggestion to omit the earthing of pole ironwork, we could not contemplate this for high-pressure lines, and the British regulations are far more sound in this respect than Messrs. Ekström's suggestion.

The actual assistance which a high-pressure insulator will get by neglecting to earth its spindle is negligible in wet weather, and surely the manufacture of porcelain has reached the stage at which it is unnecessary to insulate the insulator!

Combined overload and leakage current protection does not need introduction in this country; it has been used for many years. It is not popular, because the more sensitive you make the leakage protection the less reliable the line will be. Moreover, on pressures from 11,000 to 33,000 volts, it is generally considered that even in dry weather the earth leakage current when a wire reaches the ground is quite sufficient to trip any overload device, rendering leakage protection unnecessary.

W. Fennell,

General Manager and Engineer,

Mid-Cheshire Electricity Supply Co., Ltd.

Northwich, *September 8th*, 1928.

[The discussion on the proposed recommendations of the Overhead Lines Association was reported in our issue of February 17th, 1928, p. 309.—Eds. Elec. Rev.]

Engineering Mathematics.

The discussion on the teaching of engineering mathematics is opportune—indeed it is one of the most important subjects before the engineering world at the present date. My own experience is that it is very difficult to get teachers to take a real interest in *teaching*. It is, in fact, usually assumed that if a man is a good mathematician he must necessarily be a good teacher. In actual practice a good mathematician very often despises the art of teaching, and thinks that only fools need things to be made plain and clear. No one would think of teaching the piano by playing difficult pieces brilliantly while the pupils sat and listened! The teacher of the piano makes it his business to analyse the difficulties and to overcome them piece by piece, and teaching mathematics to be of any use must follow the same method.

I have discussed the question frequently both with students and with teachers, and have been told by most students that lectures on mathematics at our colleges are sheer waste of time. The professor writes a lot of formulas down on the blackboard and talks about them in a way that cannot be followed, after which the students go home and do their learning from books.

I have also discussed the matter with teachers. When it is suggested to them that mathematical difficulties may be cleared up, the teacher usually remarks haughtily that one must of course have brains to understand mathematics. When a clear explanation is put forward he laughs and says: "That, of course, is quite obvious, and everyone knows it."

The whole subject of teaching mathematics is in just about as unsatisfactory a position as it can be. Teachers are under the delusion that lectures should be the same as text-books, which is just what they should not be. The only object of lectures is to clear up the difficulties of the text-book. The lecturer should therefore spend his time in smoothing the way for the average student, and he should assume that the student will go to his text-book and do the bulk of his work at home. Lectures should be extremely clear and interesting, and the teacher should avoid the pitfall of trying to make them a complete treatise on the subject. When teachers get into the habit of studying the question of teaching from this point of view they will do more useful work.

Meanwhile, it will be very interesting if average students can communicate with the Editors and say if they agree with this. The brilliant ones do not count in this case, as they will learn, however bad the teaching is. It is the opinion of the average student we want.

Maths.

September 4th, 1928.

Lamp Discounts.

I think the majority of your readers will sympathise with the protest made by Mr. Hodges in your issue of August 31st. Fortunately he is not obliged to put up with any description of treatment which the B.R.V.M.A. or the E.L.M.A. or any other body cares to extend to him: he can find in the advertisement columns of your paper plenty of offers of lamps, &c., the prices of which are not controlled by either of the bodies in question. Mr. Hodges should follow the example of the British Post Office and buy in the best market. (If the Post Office has the courage—and it does not want much—to free itself from rings, we may have 1d. inland postage restored to us). I can tell Mr. Hodges that "combines," or whatever one likes to call them, are not necessarily made to protect struggling industries: I was connected with a firm which made enormous profits at its selling prices, but it did not mind entering into arrangements with other firms to get still higher prices from consumers, and the members of this happy family will go on exacting enormous prices from buyers as long as they are stupid enough to pay them. However, for lamps one certainly need not pay ridiculous prices. I have made it a point for several years to buy "non-ring lamps," and have found their performance quite equal to that of ring lamps which I previously bought.

Hadsum.

September 3rd, 1928.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1927.

15,902. "Electrical distribution fuse-boxes and similar apparatus." Midland Electric Manufacturing Co., Ltd., and W. L. Barber. June 15th, 1927. (295,787.)

16,257. "Electroplating apparatus." W. Canning & Co., Ltd., and G. A. Pope. June 18th, 1927. (295,791.)

16,854. "Electrically heated kettles, saucepans, and other apparatus." W. Edwards. June 24th, 1927. (295,796.)

17,063. "Alarm circuit systems, particularly fire-alarm signalling systems." G. C. Snyders, C. Gordon, jun., J. V. de Kamp, and C. E. A. Maitland. July 3rd, 1926. (273,710.)

17,348. "Devices for fixing objects such as coat or hat hooks, electric switches, ceiling-roses, and other objects to walls, partitions, and ceilings composed of laths and plaster." A. W. Miller. June 30th, 1927. (295,798.)

19,375. "Apparatus for closing and interrupting an electric circuit." J. F. G. P. Hartmann. July 21st, 1927. (295,817.)

31,419. "Sparking plugs." W. B. Smits. November 22nd, 1927. (Convention date not granted.) (280,971.)

31,797. "Multi-valve amplifying or receiving circuits." Siemens & Halske Akt. Ges. November 26th, 1926. (281,319.)

32,277. Electric switches." English Electric Co. Ltd., and A. R. Blandford. November 30th, 1927. (295,881.)

33,252. "Recording electrical measuring instruments." Electroflo Meters Co., Ltd (Republic Flow Meters Co.). December 8th, 1927. (295,887.)

33,498. "Maintenance of constant frequency and phase relationship in periodic processes." C. Lorenz Akt. Ges. December 11th, 1926. (282,098.)

33,972. "Regulating means for wireless and other scientific apparatus." J. R. Lecoq. December 15th, 1926. (Addition to 263,157.) (282,421.)

34,770. "Adjustable inductances." Akt. Ges. Brown, Boveri et Cie. December 27th, 1926. (282,757.)

34,748. "Apparatus for the electrical precipitation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd. (Metallbank und Metallurgische Ges. Akt. Ges.). December 22nd, 1927. (Addition to 216,789 and 230,841.) (295,890.)

35,334. "Electric motor control systems." British Thomson-Houston Co., Ltd. January 5th, 1927. (283,155.)

1928.

20,509. "Luminescent discharge tubes." Electricité Industrielle et Domestique and J. A. Florimont. August 4th, 1926. (275,632.)

22,465. "Electric switches." A. R. Rice and E. Thompstone. August 26th, 1927. (295,833.)

22,896. "Supports for trolley booms on electrically-propelled vehicles." Ransomes, Sims & Jefferies, Ltd., and F. A. Garrett. August 31st, 1927. (295,837.)

23,533. "High-tension and other dry batteries." E. C. R. Marks (Batterien- und-Elemente-Fabrik System Zoller Akt. Ges.). September 7th, 1927. (295,841.)

25,111. "Wireless apparatus." R. S. Bunting, E. A. Taylor, and British Radio Corporation, Ltd. September 23rd, 1927. (295,849.)

25,376. "Dirigible headlights for automobiles." J. A. Piper. September 27th, 1926. (278,009.)

27,345. "Electric cigar lighters." H. Agatz. October 14th, 1927. (295,859.)

28,324. "Manufacture of built-up steel field rings for dynamo-electric machines." British Thomson-Houston Co., Ltd. October 26th, 1926. (279,851.)

28,859. "Engine-starting apparatus." Delco-Remy Corporation. October 30th, 1926. (279,895.)

30,707. "Heat radiators." Luth & Rosens Elektriska-Aktiebolag. November 19th, 1926. (280,918.)

Trade Mark Applications.

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 5th, 1928:—

Anto-Mobo. No. 491,077. Class 8. Radio-telephonic and telegraphic apparatus and parts thereof.—R. I. & Varley, Ltd., Kingsway House, 103, Kingsway, W.C.2.

Tungsram. No. 491,218. Class 8. Thermionic valves for use in telegraphy and telephony.—Egzesult Izzolampa es Villamossagi Resz-Venybarsasag, Upjest, near Budapest, Hungary. (British representatives: Lloyd, Wise and Co., 10, New Court, Lincoln's Inn, W.C.2.)

Torflector No. 492,528. All goods in Class 15.—Benjamin Electric Co., Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.

Cliftex. No. 489,691. Class 50. Electrical insulating material, insulating tape, vulcanised fibre, &c.—Mosses & Mitchell, Ltd., 122-124, Golden Lane, E.C.1.

Photo-telegraphy in America.

The Postal Telegraph Company put into commercial operation on September 5th in the United States a new photo-telegraphic service. One part of the service permits of the sending, between any two of eight of the largest cities of the country, of telegraph messages which will be delivered to the addresses in facsimile. The charge for such messages is one and a half times the ordinary commercial telegraph rate. Thus, a ten-word message by photogram from New York to Boston, for example, costs 54 c. (2s. 3d.), to Cleveland 72 c. (3s.), to San Francisco $1.80 (7s. 6d.). Another part of the service provides for the transmitting of pictures, documents, advertisements, &c., messages in, for example, Chinese or Hebrew; in fact, anything that can be photographed. The charges for sending photogram pictures, on a plate 5 in. by 7 in., from New York, are $15 (£3) to Boston or Cleveland, $20 (£4) to Atlanta or Chicago, $25 (£5) to St. Louis, and $45 (£9) to Los Angeles or San Francisco. These services, says *The Times*, have been made possible by a contract with the American Telephone and Telegraph Company.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

BECKENHAM.—Bus garage, offices, &c., Elmers End, for the London General Omnibus Co., Ltd.

BISHOPSTHORPE.—Pumping plant, house, and sewage disposal works, Copmanthorpe (deposit £2 2s.); Fairbank and Son, engineers, Tudor House, Stonegate, York.

BOLTON.—Extensions to Ocean Mills, Settle Street; Great Lever Spinning Co., Ltd. Extensions, Bentinck Street; Bolton Co-operative Cabinet Makers' Society.

BO'NESS.—Roman Catholic Church; the priest-in-charge.

BRADFORD.—Mental hospital (first section, £100,000); city engineer.

BREDBURY AND ROMILEY.—Additional 36 houses for the U.D.C.; surveyor.

BRISTOL.—Works, Gloucester Lane, for Ridingbery & Co., Ltd., toy and box makers (£10,000).

BROMSGROVE.—Infirmary extensions, including operating theatre, for the B.G.; clerk.

CHESTERFIELD.—Additional 23 houses, for the T.C.; W. A. Derbyshire, architect, 30, Gluman Gate (returnable deposit of £1 1s.).

CLAYTON (MANCHESTER).—Cinema, for a syndicate comprising Messrs. A. L. Ward, Alfred Snape, and B. Cramer.

COVENTRY.—Bank, High Street, for the National Provincial Bank, Ltd., London.

CROYDON.—Block of eight shops and dwellings for the T.C.; borough engineer (returnable deposit of £3 3s.).

DUNDEE.—Power house for Baxter Bros. & Co., Ltd.; the manager.

EASTBOURNE.—Alterations, Pier Hotel, Cavendish Place; P. D. Stoneham & Son, architects. Twenty-two houses, Rotunda Road; S. G. Scales, architect.

EAST MALLING (MAIDSTONE).—Fruit storage testing station, with electrical work, for H.M. Office of Works, King Charles Street, London, S.W.

ELLESMERE PORT AND WHITBY.—Housing scheme (232), for the U.D.C.; T. W. Francis, clerk (returnable deposit of £5 5s.).

ELY.—Isolation wards, for the B.G.; F. W. Green, clerk, 11, Lynn Road.

EPSOM.—Extensions to electricity works for the U.D.C.; A. C. Williams & Pettett, architects, Reid's Building, Ashley Road (returnable deposit of £2 2s.).

GLASGOW.—Chill room accommodation, &c., for Corporation Market Committee (£40,000); city engineer. Welfare centre, Paterson Street; city engineer.

GOOLE.—Slaughter-house, cooling room, &c., for the U.D.C.; Farrow & Sons, builders, Doncaster.

GREAT TOTHAM (ESSEX).—Power house, Colchester Road, for G. Sketch.

HAMILTON.—Extensions at Maternity Home and Child Welfare Centre (£4,000); Cullen, Lochhead & Brown, architects.

HEREFORD.—Discharge block, &c., Tupsley infectious diseases hospital, for the T.C.; city engineer.

INVERNESS.—Public baths (£16,000); burgh surveyor.

KIDDERMINSTER.—Housing scheme (18), for the T.C.; J. Hawcroft, borough engineer, 110, Mill Street.

LEEDS.—Bank, North Lane, Headingley; C. G. Hemsley. Thirty flats, Wood Lane, Headlingley; A. Braithwaite and Co., Ltd. Development, Sir Rowland Barran's Estate, Chapel Allerton Hall; Carby Hall & Son, architects.

LITTLE THURROCK.—Housing scheme (30), for Orsett R.D.C.; surveyor, Palmer's Avenue, Grays.

LIVERPOOL.—Library (£11,500); land steward and surveyor, municipal buildings.

LONDON (ILFORD, E.).—Housing scheme (120), Tomswood Estate, for the T.C.; borough surveyor.

(CRICKLEWOOD, N.W.).—Library (£7,300); Willesden U.D.C. surveyor. Offices for L.G.O.C., Edgware Road; S. A. Heaps.

LONDON.—*Continued.*

(WILLESDEN, N.W.).—Store for Indestructible Paint Co., Whitby Avenue, Park Royal; C. F. Mearley, Ltd.

(BERMONDSEY, S.E.).—Building, 116, Tanner Street, for Wilson's Cooperage Co., Ltd.; William Harbrow, Ltd.

(FOREST HILL, S.E.).—Extensions, Constitutional Club; E. A. Stone, architect, 20, Berkeley Street, W.

(CHELSEA, S.W.).—Offices, Sloane Avenue and Makins Street; Hammond & Barr, Ltd.

(KENSINGTON, S.W.).—450 tenements, St. Quintin Estate; Sutton trustees.

LUTON.—Offices, King Street, for the Northampton Town and County Benefit Building Society; F. H. Allen, architect, 26, Abington Street, Northampton.

MANCHESTER.—Adaptation old school, Princess Street, for School of Commerce (£6,500); Education Committee. Stables and garage, Claremont Road cleansing depot, Rusholme (deposit £1 1s., last date September 12th); city architect, Town Hall. Kingsway municipal school, Burnage (deposit £2 2s.); education offices, Deansgate. Hough Road municipal school, Withington (deposit £2 2s.); education offices, Deansgate. Alterations, St. Luke's Hospital; governors.

MELTON MOWBRAY.—Extensions to war memorial hospital, including X-ray department (£30,000); secretary.

NEWCASTLE-ON-TYNE.—'Bus garage; city engineer.

NEWHAVEN.—Factory, for Felix Macauley, Ltd.

NEW ROMNEY (KENT).—Church, for the Wesleyan trustees; secretary.

NORTHAMPTON.—Fifty-seven houses, Kingsthorpe Estate; borough engineer.

PORT ERIN (I.O.M.).—Repeater telephone station for H.M. Office of Works; Joseph McArd & Sons, contractors.

RUGBY.—Central school (£18,000); Warwickshire county architect.

ST. ALBANS.—Extensions to St. Albans school, for the governors; Percival C. Blow, architect; M. & F. O. Foster and Co., builders, Hitchin.

SHEFFIELD.—Thirty-seven houses, Longley Estate; H. Freckingham & Sons, Ltd. Fifty-seven houses, Longley Estate; M. J. Gleeson, Ltd. Thirty-eight houses, Greystones Crescent; William Malthouse, Ltd. Two reconstruction schemes, Bailey Street and Spring Street areas; city architect. Housing scheme, Wisewood Estate; city architect.

SOUTHPORT.—Electric light installation, Ainsdale branch library, for the T.C.; borough electrical engineer (no date given).

STOURBRIDGE.—Cinema for Stourbridge Central Theatre, Ltd.; Webb & Gray, architects, Dudley; A. J. Crump, builder, Dudley. United Methodist Sunday schools, Cradley Forge (£2,700); trustees.

STRETFORD.—Sixty-four houses, King's Road, &c.; J. G. Whitelegge. Thirty houses, Colwell Avenue; E. Jackson. Eighty-seven houses, Nateley Road, &c.; W. R. Rochell. Extensions, Elsinore Road; Switchgear and Cowans, Ltd.

TALGARTH (BRECONSHIRE).—Church, for the Calvinistic Methodist trustees; J. C. Evans, builder.

TODMORDEN.—Casual wards (£6,000), for the B.G.; clerk.

TORQUAY.—Technical school; Devon Education Committee.

WAKEFIELD.—Erection of sanitary annexe at the Wakefield Mental Hospital (£1 deposit); tenders to W. E. H. Burton, architect, West Riding Mental Hospital Board office.

WALSALL.—180 houses, North Walsall Estate; borough engineer.

WATERFOOT (LANCS.).—Re-erection of portion of Green Bridge Shoe and Slipper Works, for Joshua Trickett, Ltd. (£25,000 to £30,000).

WEMBLEY.—Shops and flats, estate near High Road; Mr. De la Rue.

WINDSOR.—Playhouse; R. Cromie, architect, 73, Edgware Road, London, W.; W. Creed & Co., builders, Maidenhead.